Spring 2015 IceBridge C-130 Flight Plans
16 January 2015 Draft

compiled by

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Introduction to Flight Plans

This document is a translation of the NASA Operation IceBridge (OIB) scientific objectives articulated in the Level 1 OIB Science Requirements, at the January IceBridge Arctic planning meeting held at NASA GSFC, through official science team telecons and through e-mail communication and iterations into a series of operationally realistic flight plans, intended to be flown by NASA's P-3 aircraft, beginning in early-March and ending in late May 2015. The material is shown on the following pages in the distilled form of a map and brief text description of each science flight. Google Earth (KML) versions of these flight plans are available via anonymous FTP at the following address: ftp://atm.wff.nasa.gov/outgoing/oibscienceteam/. Note that some users have reported problems connecting to this address with certain browsers. Command-line FTP and software tools such as Filezilla may be of help in such situations.

For each planned mission, we give a map and brief text description for the mission. The missions are planned to be flown from Thule and Kangerlussuaq, Greenland, and Fairbanks, Alaska. A careful reader may notice that some of the mission maps in the main part of the document highlight flightlines in green, yellow, and red colors, while other only show the black lines. The colors are a refinement added to the flight plans at a late stage of design which help the field team navigate the aircraft properly to achieve specific science goals. The colors represent the degree of "straightness" of each flight segment, where straight segments are steered using an automated technique and curved sections using a specialized manual method. Not all of the flight plans shown here have necessarily reached that mature stage of design.

In fact, as a general rule the flight plans depicted here are all at varying stages of completeness. For each mission we note "Remaining Design Issues" to be resolved, if any exist. In most cases these are minor. CryoSat underflights are a major exception, since these have to be re-planned for each potential flight day (for sea ice) or within a window of several potential flight days (for land ice). Sea ice camp/site overflights are also an exception, since these move with the motion of the ice, unless they are situated on shore-fast ice.

Several of the Greenland missions can be configured either as round-trip missions originating and ending at the same base, or as transit flights between Thule and Kangerlussuaq. These are prominently identified in the text accompanying the missions. The field team will ensure that the highest-priority flights are completed as weather and logistical considerations allow, and the transit missions will be configured and selected accordingly.

Note that this document shows 53 planned land ice and 19 planned sea ice missions, which is more than we expect to fly this year. The extra flight plans give us operational flexibility to fly as much as possible, and scientifically productive, while we are in the field. The entire suite of 72 flight plans is depicted in the introductory material following this text.

Each flight has a priority assigned to it by the OIB science team, either high, medium or low, and these are listed below with each mission. For the land ice flights, we add a "baseline", or highest, priority, which is reserved for flights intended to be flown each year. There are seven such flights. The team instituted a refined strategy for the 2014 season, which emphasized the need to conduct comprehensive dh/dt monitoring over a multi-year time scale. We continue this strategy for 2015. 31 flights have been identified as being suitable for inclusion into this strategy, and these are labeled as such in the text descriptions. In general the flights in this category which have not been flown recently are prioritized

highest, while those flown last year are prioritized lowest. These priorities will be revisited each year, with the goal being to ensure all thirty-one of these flights will be flown on a rotating basis. This repeat strategy is depicted in the introductory material following this text, Several new flights are also shown, as well as several flights designed for previous years but never flown.

For the sea ice flights, the OIB science team identified three missions which can by flown during the second Thule deployment in late April and May. These flights are prominently identified in the text accompanying each mission.

IceBridge Mission Statement
Operation IceBridge will employ aircraft to monitor the most sensitive and critical areas of sea ice, ice sheets and glaciers during the gap in satellite coverage caused by the failure of ICESat-1, in 2009, and the launch of ICESat-2, planned for 2016. Sensitive and critical areas include coastal Greenland and especially its outlet glaciers, costal Antarctica including the Antarctic Peninsula and ice shelves, the sea ice of the Arctic and Antarctic and the southeast Alaskan glaciers. Data collected by IceBridge will improve our knowledge of the contribution of the Greenland and Antarctic ice sheets to sea level rise and will make fundamental contributions to the understanding of changes occurring in the extent and thickness of the polar sea ice cover. Given the societal importance of understanding changes in sea level rise and sea ice extent, IceBridge data will monitor and improve modeling efforts for sea ice, ice sheet and glaciers. IceBridge will also prepare for the future of airborne monitoring efforts of the cryosphere by adapting existing instruments for high altitude unmanned aerial systems such as the NASA Global Hawk.

IceBridge Science Objectives
The following are the major science objectives of Operation IceBridge in priority order and are meet by the following flight plans:
1) Make airborne laser altimetry measurements over the ice sheets and sea ice to fill in the data gap between the failure of ICESat-1 in 2009 and the launch of ICESat-2 planned for 2015.

2) Link measurements made by ICESat, ICESat-2, and CryoSat-2 to allow their comparison and the production of a long-term, ice sheet altimetry record.

3) Use airborne altimetry and radar to monitor key, rapidly changing areas of ice, including sea ice, ice sheets and glaciers, in the Arctic and Antarctic to maintain a long term observation record, improve understanding of glacial dynamics, and augment predictive models of sea level rise and sea ice cover.

4) In conjunction with altimetry measurements, collect other remotely sensed data to improve predictive models of sea level rise and sea ice cover, especially the following:

- Ice sheet and sea ice thickness, structure and extent;
- Bed topography underlying land-based ice;
- Bathymetry beneath floating ice shelves;
- Snow accumulation and firn structure; and
- Other geophysical constraints that will improve estimates of the geothermal and oceanic heat flux

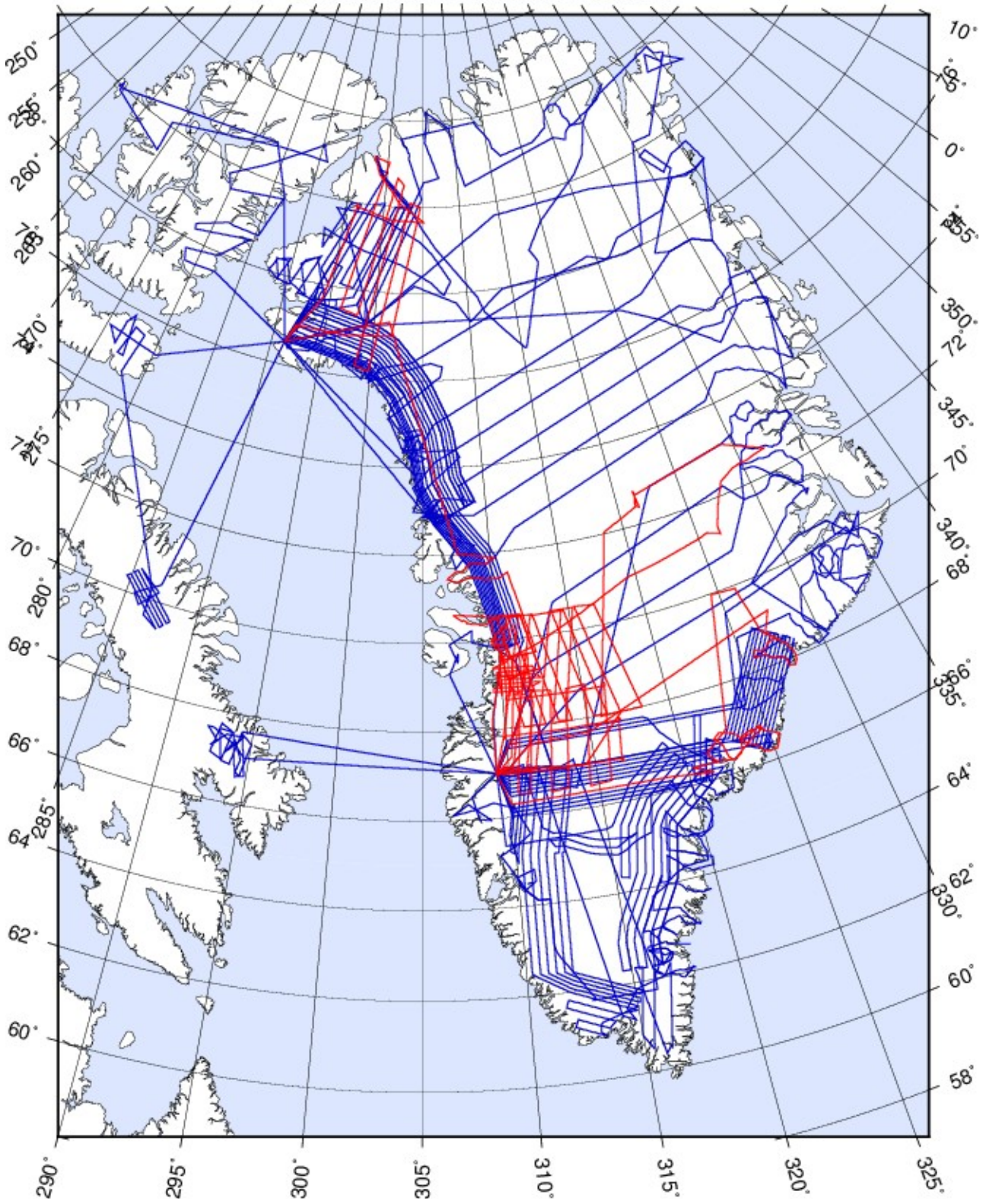
5) Adapt existing instruments for airborne remote sensing of ice by high altitude unmanned aerial systems such as the NASA Global Hawk.

Map of all planned 2015 missions (TBD)

Land Ice Repeat Strategy

OIB Greenland Spring 2015

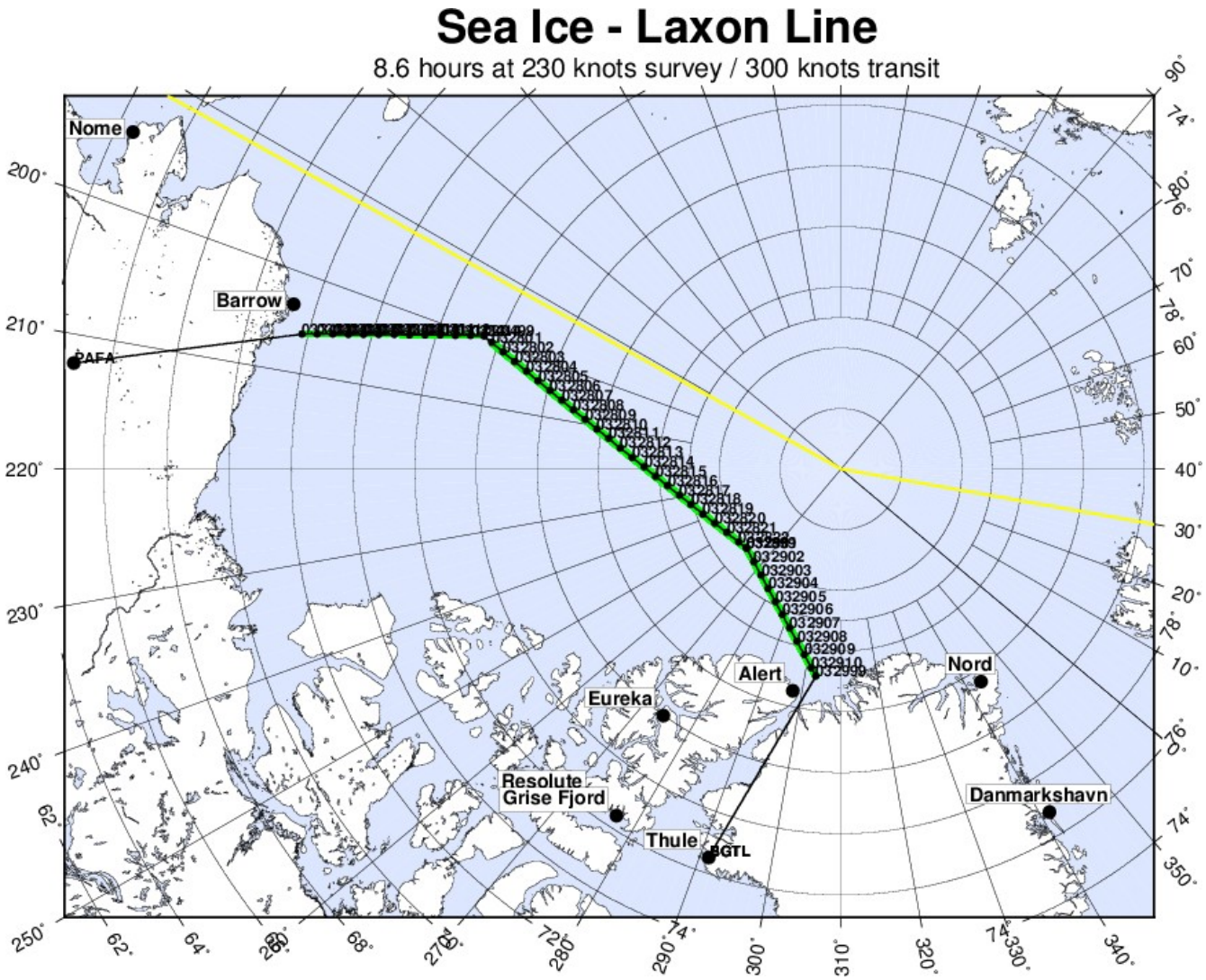
Red: Annual Blue: Subannual



Sea Ice – Laxon Line / Thule – Fairbanks (provisional)

This mission is a near-exact repeat of similar missions flown each year of OIB beginning in 2009. In addition to Level-1 Requirements SI1 and SI2, the flight addresses sea ice level 1 baseline requirement SI3a by providing data on the thickness gradient and distribution of perennial and seasonal ice across the Arctic Basin.

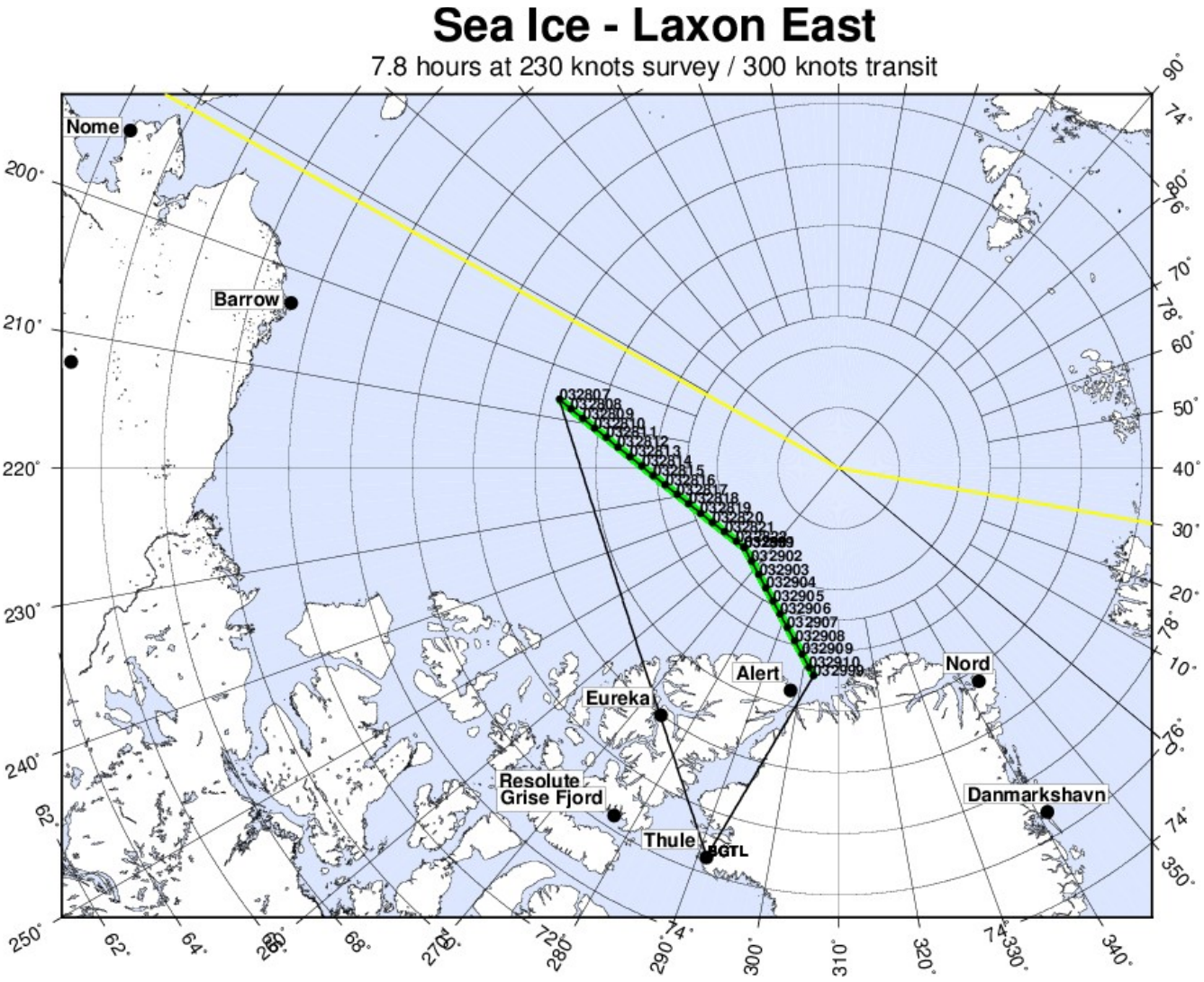
Flight Priority: high
ICESat Tracks: 0329,0328,0334
Last Flown: 2013
Remaining Design Issues: none



Sea Ice – Laxon East / Thule (provisional)

This mission, along with Laxon West, is a contingency mission to be considered in case the Laxon Line cannot be successfully flown during the Thule/Fairbanks transits. It is intended to capture the eastern portion of the line, then return direct to Thule at high-altitude.

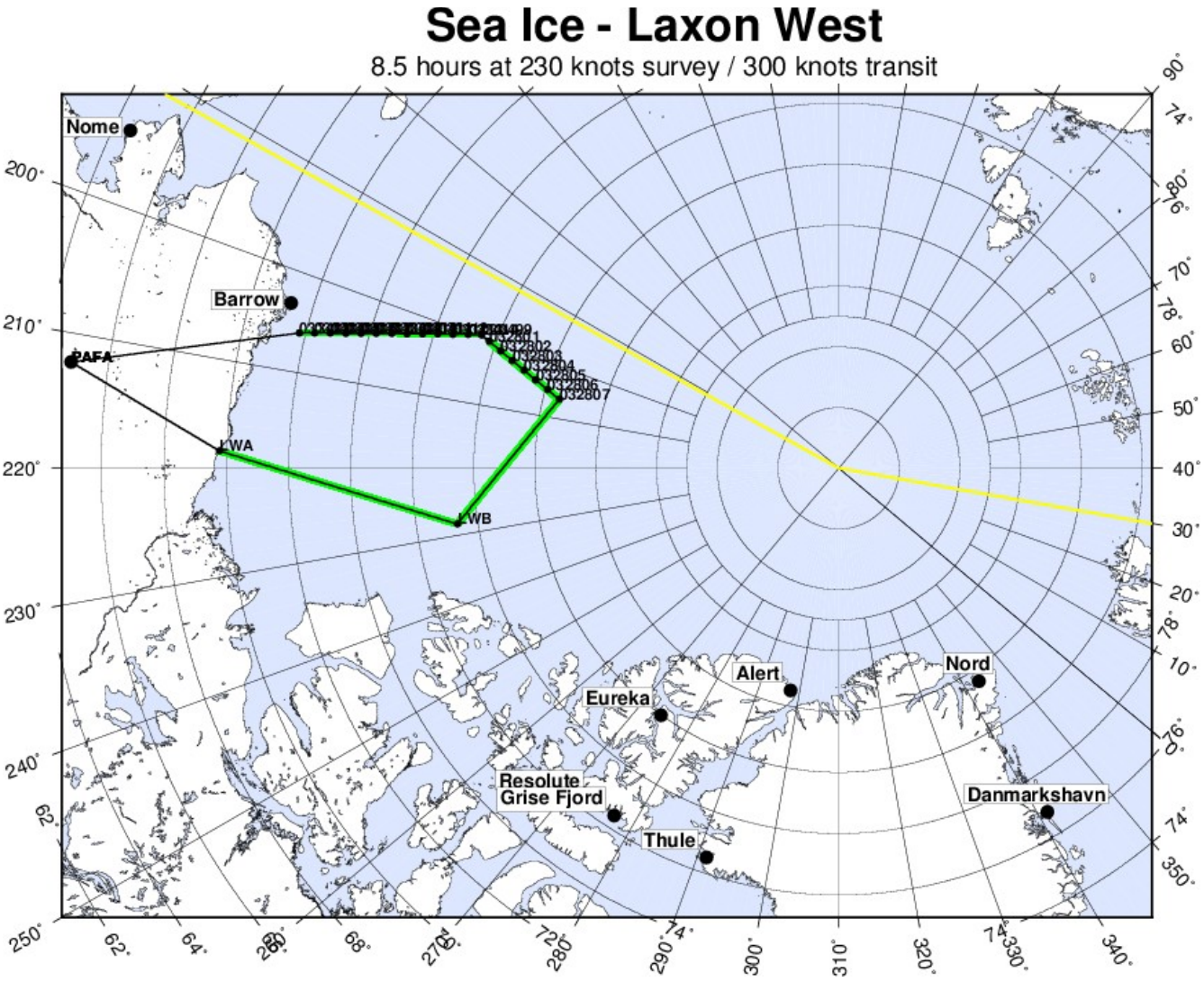
Flight Priority: high if Laxon Line not flown, otherwise discard
ICESat Tracks: 0329,0328
Last Flown: new flight
Remaining Design Issues: none



Sea Ice – Laxon West / Fairbanks (provisional)

This mission, along with Laxon East, is a contingency mission to be considered in case the Laxon Line cannot be successfully flown during the Thule/Fairbanks transits. It is intended to capture the western portion of the line, then returns to the eastern Alaska coast along a productive route at low-altitude.

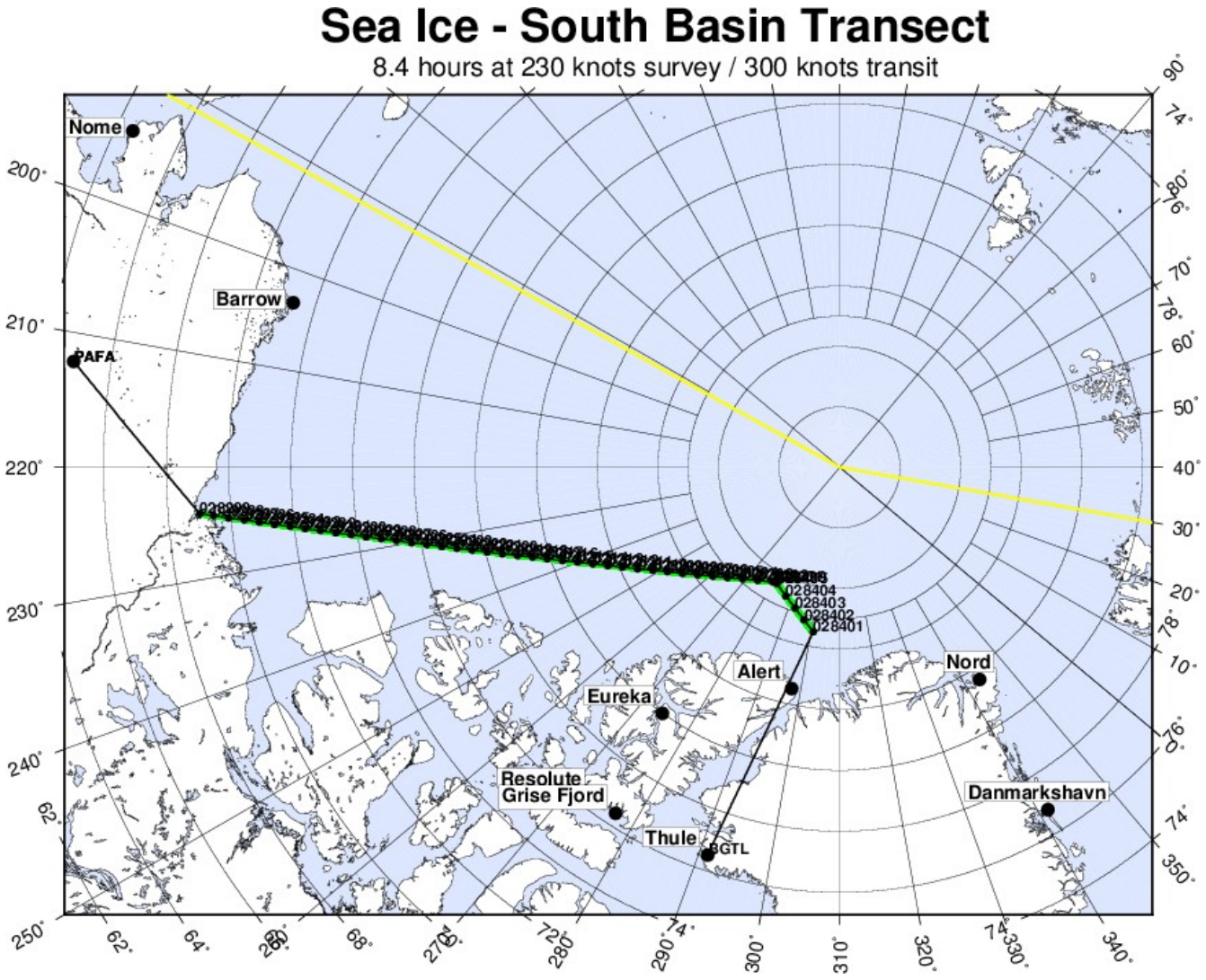
Flight Priority: high if Laxon Line not flown, otherwise discard
ICESat Tracks: 0328,0334
Last Flown: new flight
Remaining Design Issues: none



Sea Ice – South Basin Transect / Thule – Fairbanks (provisional)

This mission is a repeat of missions flown each year of OIB beginning in 2009. Timing on this flight is challenging because we must land at Thule before the airfield closes at 1600 local time, which is five hours ahead of Fairbanks local time. This means that we must depart Fairbanks before approximately 0200 local time, and this in turn means that we must fly the first few hours of this flight in darkness. In addition to Level-1 Requirements SI1 and SI2, it addresses sea ice level 1 baseline requirement SI3a by providing data on the thickness gradient and distribution of perennial and seasonal ice across the Arctic Basin.

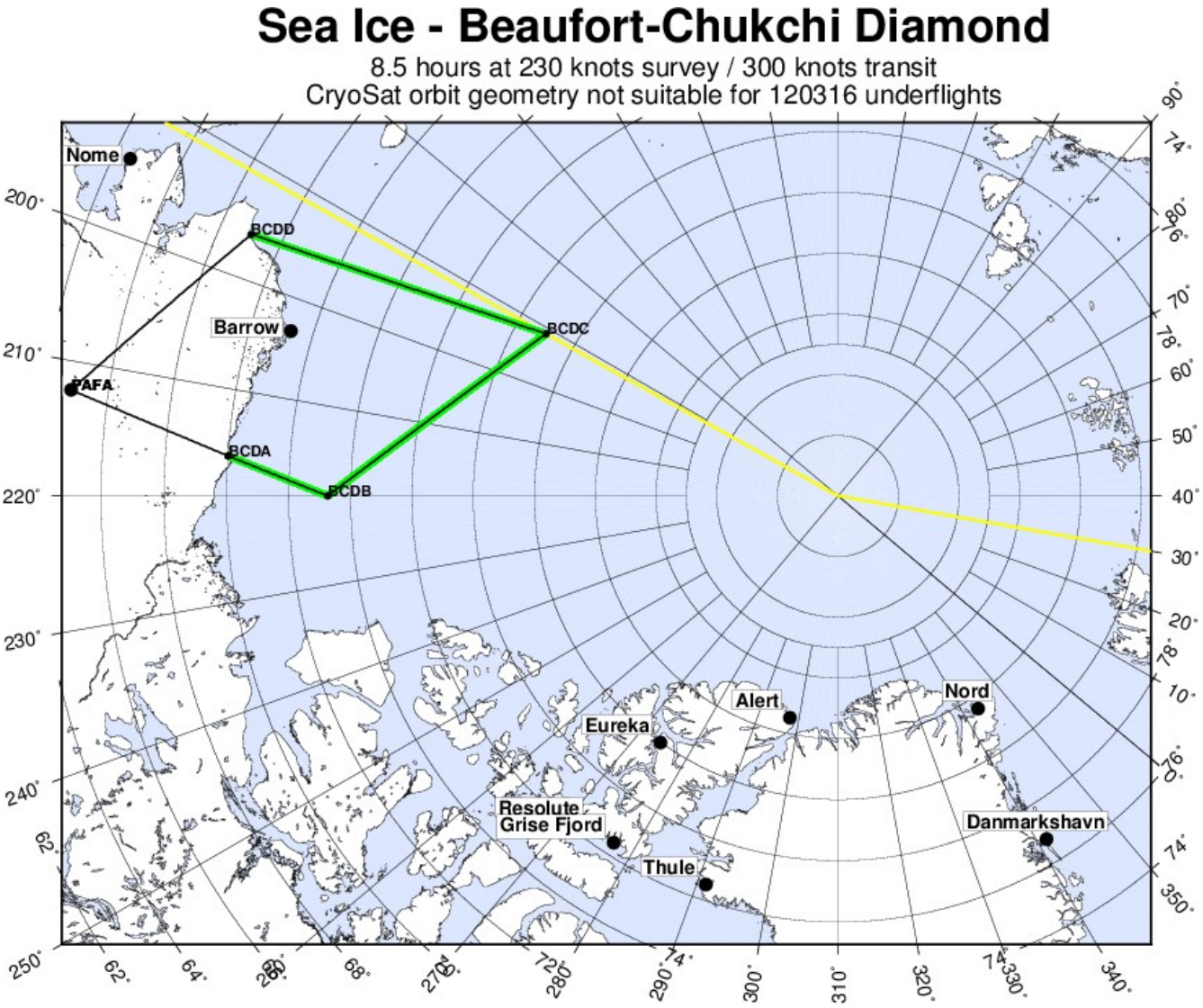
Flight Priority: high
ICESat Tracks: 0282,0284
Last Flown: 2013
Remaining Design Issues: none



Sea Ice – Beaufort-Chukchi Diamond / Fairbanks (provisional)

This is a repeat of a mission first flown in 2012. It is designed to sample sea ice in the western Arctic Basin along north-south gradients in the Chukchi and Beaufort Seas. In addition to Level-1 Requirements SI1 and SI2, it addresses sea ice level projected requirement SIP2d by extending sea ice baseline observations to the southern Chukchi Sea north of the Bering Strait.

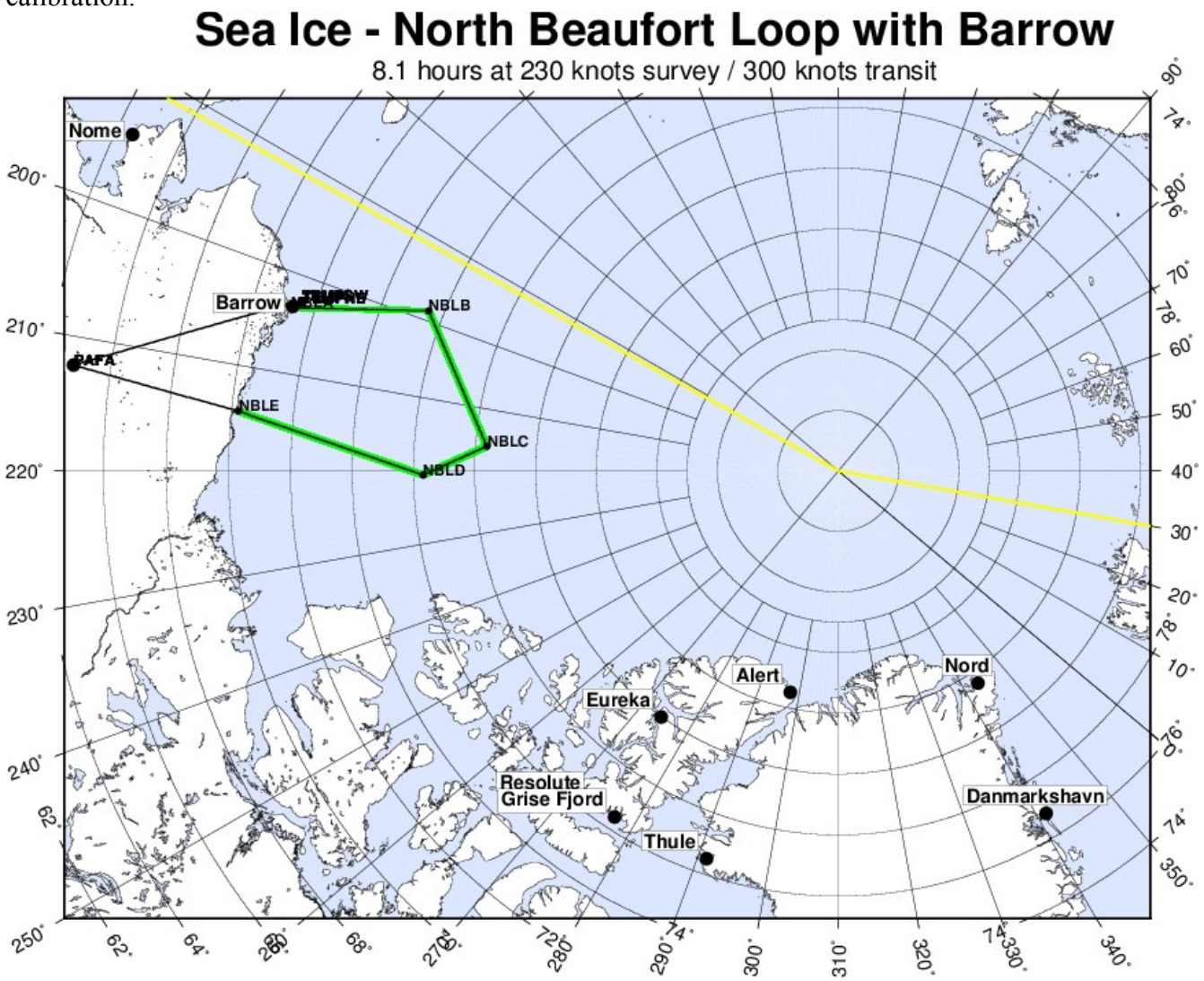
Flight Priority: high **(**paired with North Beaufort Loop) – this is higher-priority of the two, but drops to medium if North Beaufort Loop is flown first
ICESat Tracks: none
Last Flown: 2013
Remaining Design Issues: none



Sea Ice – North Beaufort Loop (with Barrow) / Fairbanks (provisional)

This is a new mission. It is intended to sample sea ice in the western Arctic Basin along north-south gradients in the Beaufort Sea, and to improve gaps in previous coverage primarily in the northeastern Beaufort. It is also the backup option to incorporate overflights of the NRL field sites near Barrow, with "SIZRS Zigzag" as the primary. It addresses Level-1 Requirements SI1 and SI2.

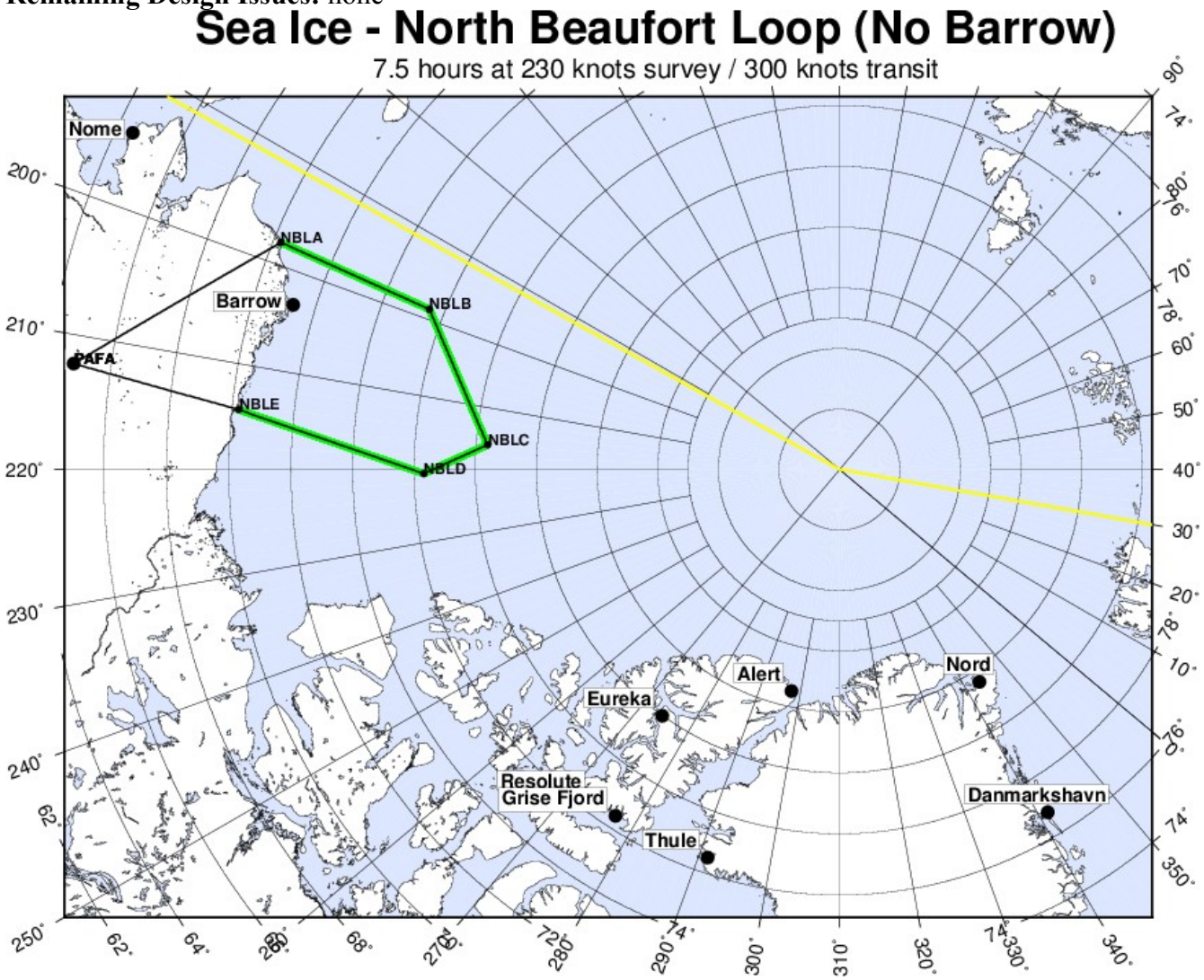
Flight Priority: high (paired with Beaufort-Chukchi Diamond) – this is the lower priority of the two, and drops to medium if Beaufort-Chukchi Diamond is flown first
ICESat Tracks: none
Last Flown: new flight
Remaining Design Issues: refine Barrow NRL site overflight (5 passes) according to updated waypoints from GPS buoys (operating 14-26 March). Also overfly nearby lead if within 5 km for calibration.



Sea Ice – North Beaufort Loop (no Barrow) / Fairbanks (provisional)

This is a new mission. It is intended to sample sea ice in the western Arctic Basin along north-south gradients in the Beaufort Sea, and to improve gaps in previous coverage primarily in the northeastern Beaufort. It is intended to be flown instead of "North Beaufort Loop (with Barrow)" in case the Barrow NRL overflights are done in the SIZRS Zigzag flight. In addition to Level-1 Requirements SI1 and SI2, it addresses sea ice level projected requirement SIP2d by extending sea ice baseline observations to the southern Chukchi Sea north of the Bering Strait.

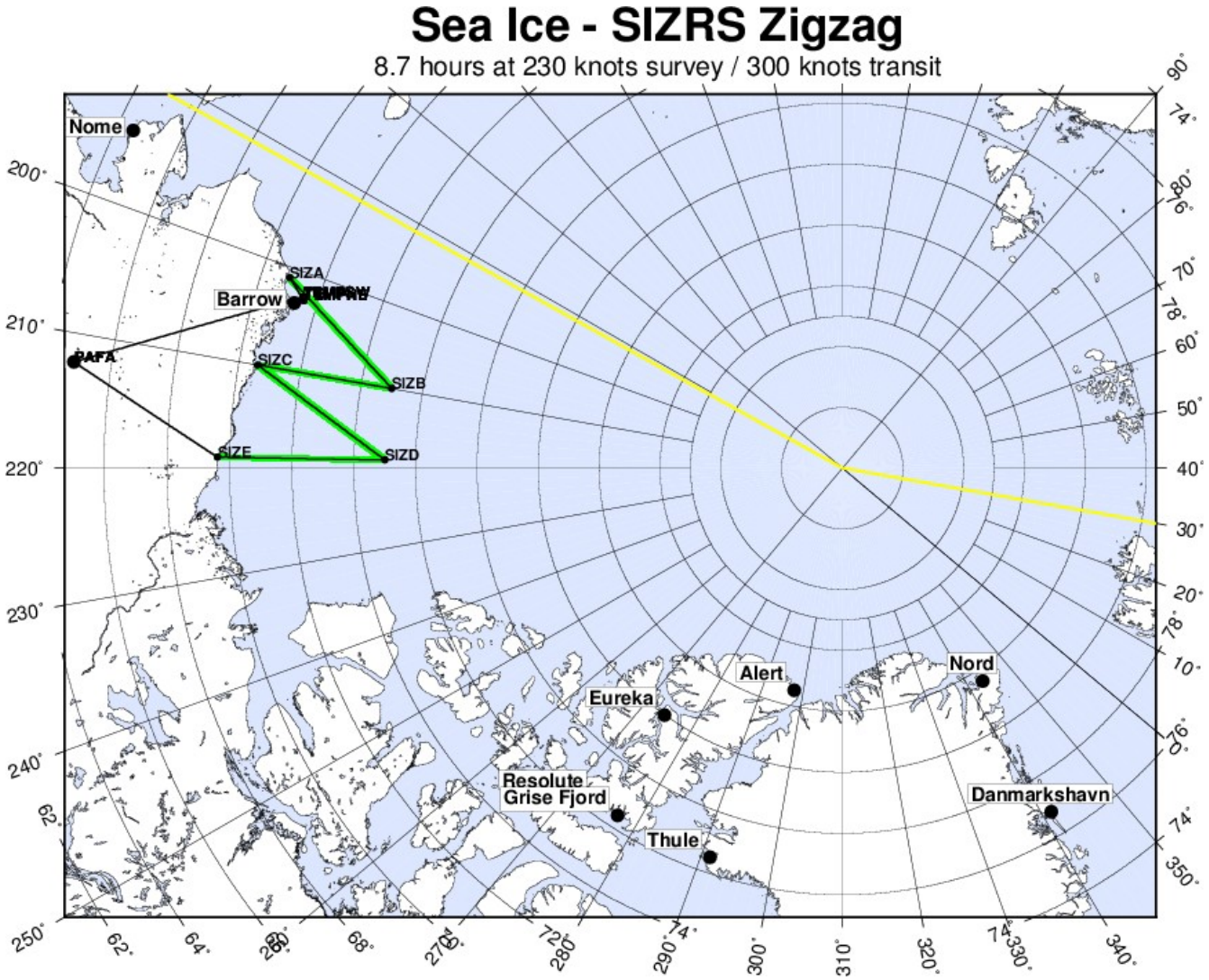
Flight Priority: high (paired with Beaufort-Chukchi Diamond) – this is the lower priority of the two, and drops to medium if Beaufort-Chukchi Diamond is flown first
ICESat Tracks: none
Last Flown: new flight
Remaining Design Issues: none



Sea Ice – SIZRS Zig-Zag / Fairbanks (provisional)

This mission is designed to sample sea ice along the north-south gradient in the southern Beaufort Sea. The leg flown along the 210th meridian facilitates a new collaboration between OIB and the Seasonal Ice Zone Reconnaissance Surveys (SIZRS) program, and it improves the temporal extent of the SIZRS time series into early spring. This is the primary flight in which to incorporate the NRL site overflights near Barrow, with North Beaufort Loop as the backup. In addition to Level-1 Requirements SI1 and SI2, this mission addresses sea ice level 1 projected requirement SIP2d by extending sea ice baseline observations to the southern Beaufort and Chukchi Seas; sea ice level 1 baseline requirement SI4 by conducting a sampling mission that is time-coincident with a CryoSat-2 track; sea ice baseline level-1 requirement SI9 by coordinating with a field campaign the complements the IceBridge measurements.

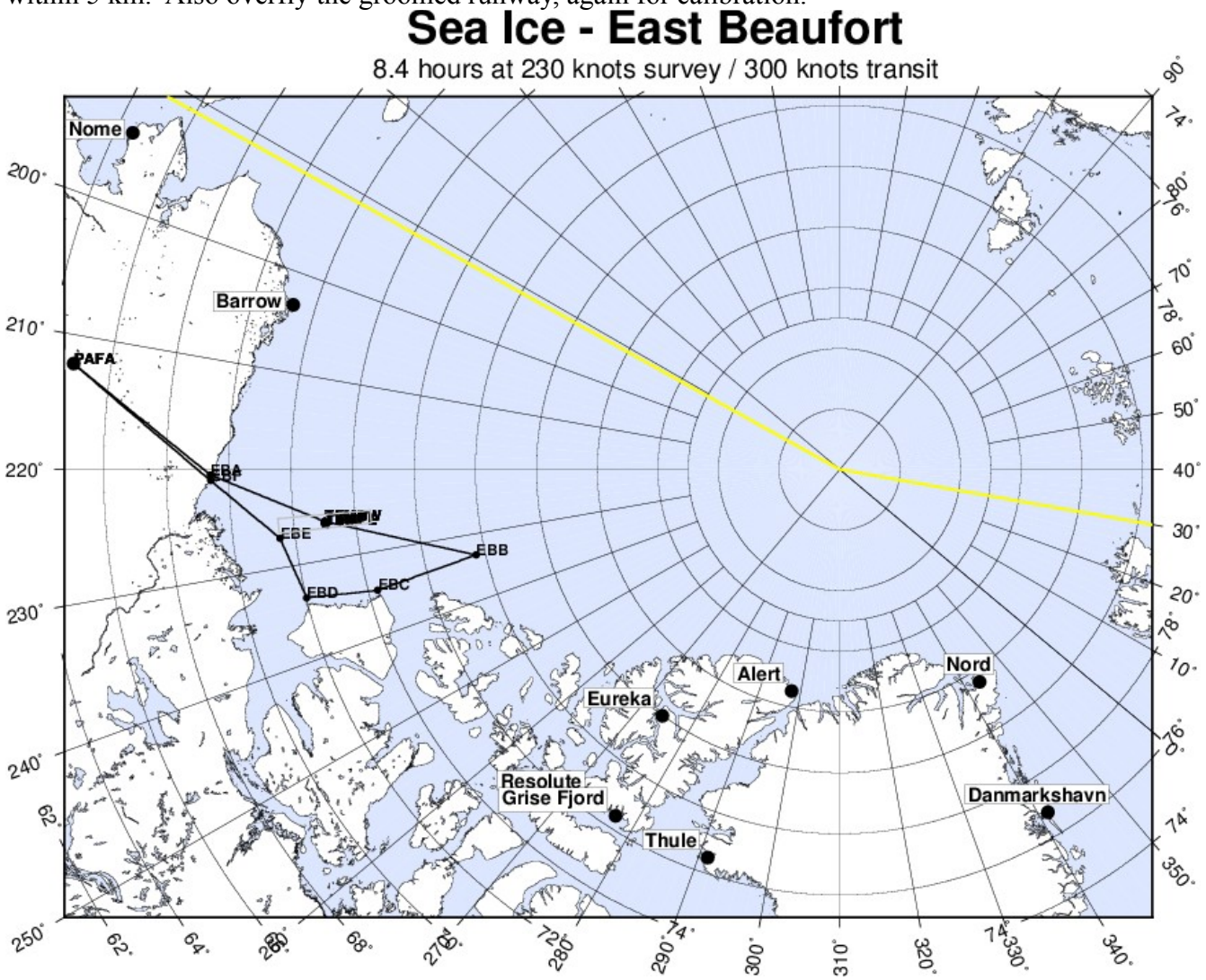
Flight Priority: high
ICESat Tracks: none
Last Flown: 2013
Remaining Design Issues: refine Barrow NRL site overflight (5 passes) according to updated waypoints from GPS buoys (operating 14-26 March). Also overfly nearby lead if within 5 km for calibration.



Sea Ice – East Beaufort / Fairbanks (provisional)

This mission is designed to sample sea ice in the eastern Beaufort Sea in an area which lacked OIB coverage prior to 2013, which is also of priority interest to the Canadian Space Agency. We also overfly the CryoVex Marginal Ice Zone Camp #2 with 8-9 overflights. The leg near Banks Island (EBC-EBD) should be adjusted in real-time to overfly the very thin ice which typically forms in this region. In addition to Level-1 Requirements SI1 and SI2, it addresses sea ice level 1 projected requirement SIP2b by extending sea ice baseline observations to the southern Beaufort Sea, west of Banks Island.

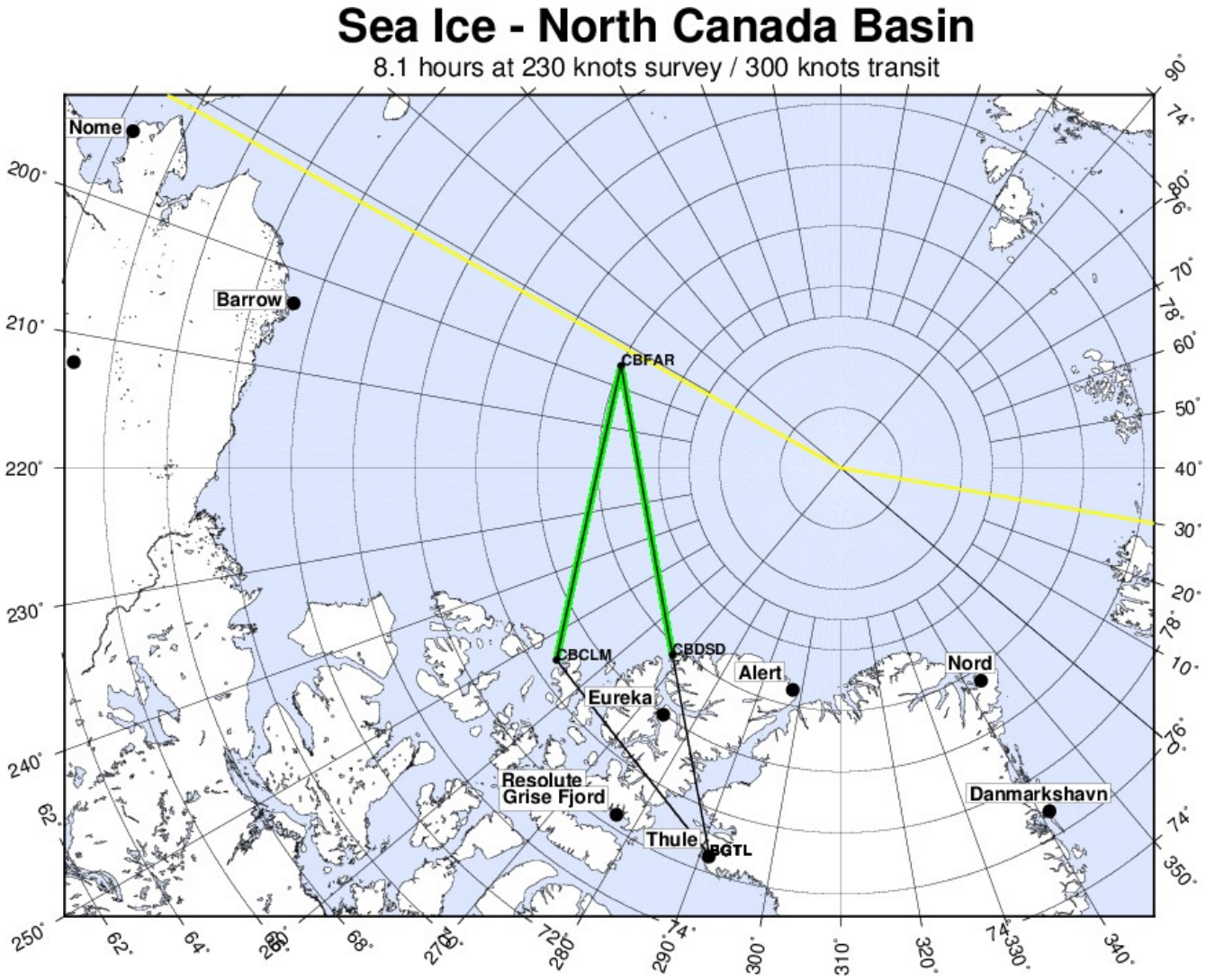
Flight Priority: high
ICESat Tracks: none
Last Flown: 2013
Remaining Design Issues: refine MIZ site overflight (8-9 passes) according to updated waypoints from GPS buoys (MIZ camp in operation 15-21 March). Overfly lead (for calibration) if one exists within 5 km. Also overfly the groomed runway, again for calibration.



Sea Ice – North Canada Basin / Thule (provisional)

This is a repeat of a mission first flown in 2012. It is designed to sample sea ice in a large region between the North Basin Transect and the Beaufort-Chukchi Diamond that had been poorly sampled by OIB prior to 2012. In addition to Level 1 Requirements SI1 and SI2, the mission addresses sea ice level 1 projected requirement SIP2 by extending the baseline observations into other regions of the Arctic Basin. **This mission can be flown during the May Thule deployment if it is not flown in March.**

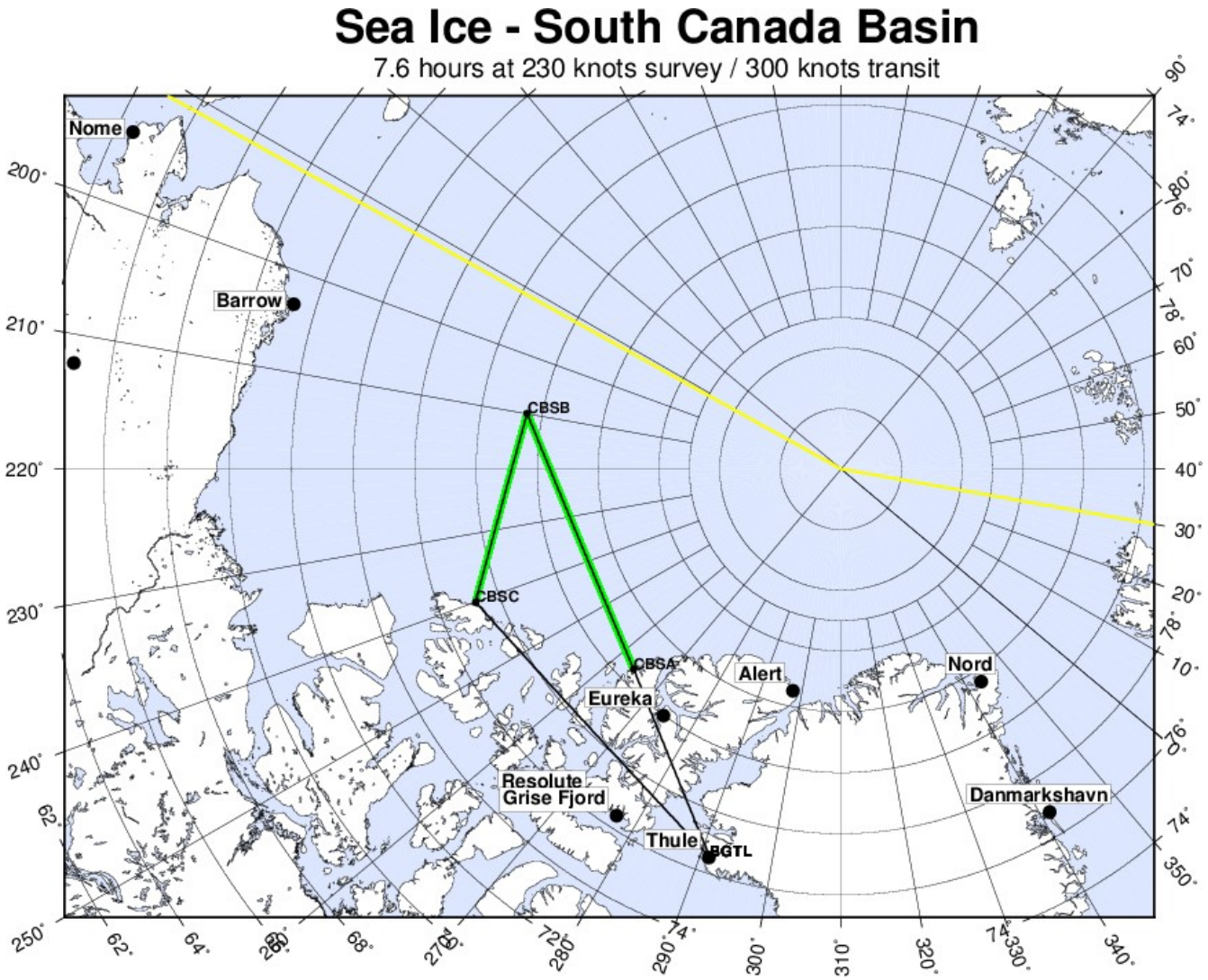
Flight Priority: high (paired with South Canada Basin) – this is the higher-priority of the two, but drops to medium if South Canada Basin is flown first
ICESat Tracks: none
Last Flown: 2013
Remaining Design Issues: none



Sea Ice – South Canada Basin / Thule (provisional)

This mission is designed to enhance the sampling in the large region between the North Basin Transect and the Beaufort-Chukchi Diamond that had been poorly sampled by OIB prior to 2012. This is a region of priority interest to the Canadian Space Agency. In addition to Level 1 Requirements SI1 and SI2, the mission addresses sea ice level 1 projected requirement SIP2 by extending the baseline observations into other regions of the Arctic Basin.

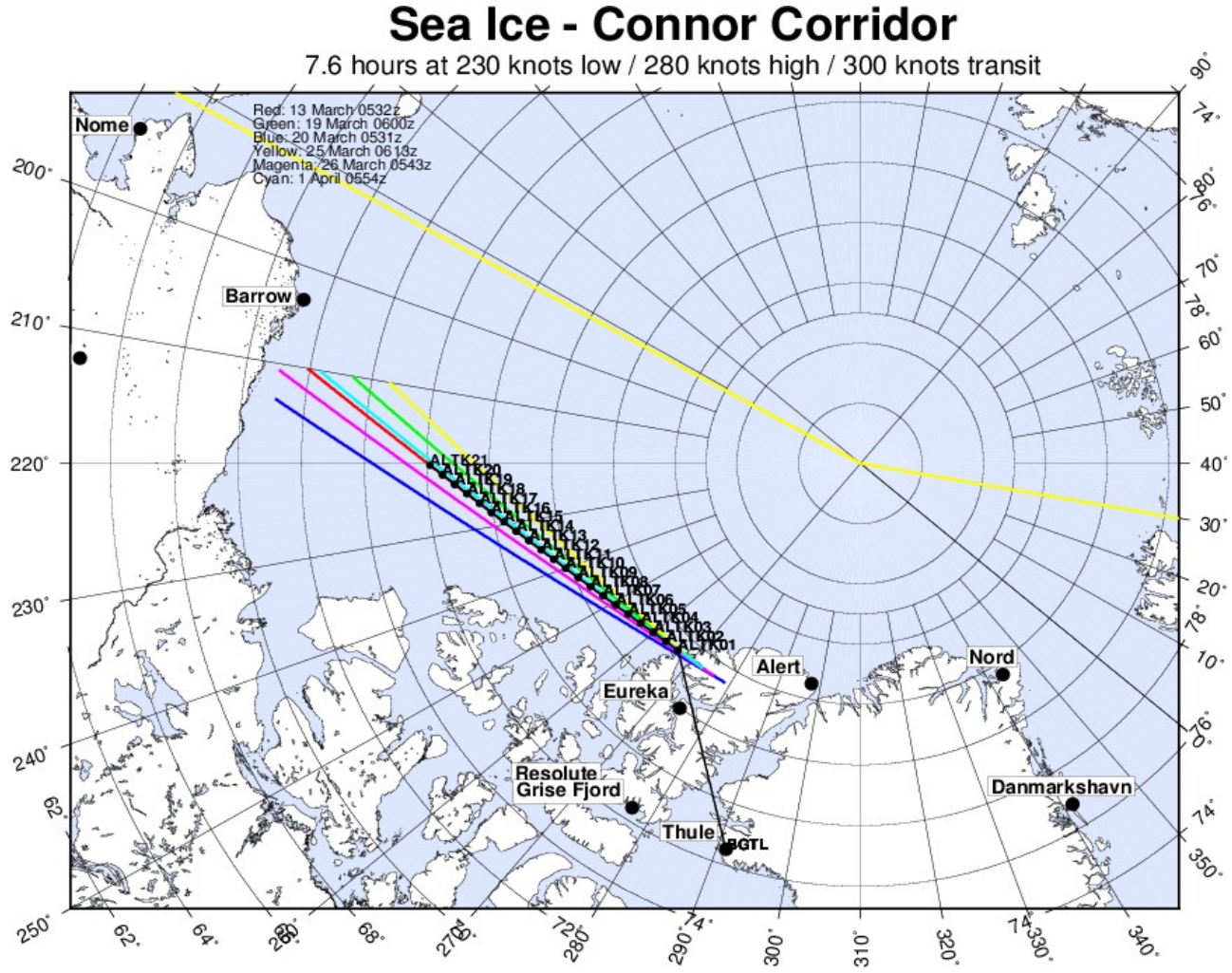
Flight Priority: high (paired with North Canada Basin) – this is lower priority of the two, and drops to medium if North Canada Basin is flown first
ICESat Tracks: none
Last Flown: 2013
Remaining Design Issues: none



Sea Ice – Connor Corridor / Thule (provisional)

This is a modified version of the Connor Corridor mission last flown in 2012. This time we underfly the SARAL spacecraft, which uses the same orbit as Envisat and operates a Ka-band (35.75 GHz) radar altimeter known as AltiKa. We fly the same line out and back, flying the out leg at the normal 1500' altitude, and the return leg at ~15,000'. This flight allows continuation of a data set collected many times along similar lines since 2006. In addition to Level 1 Requirements SI1 and SI2, the flight addresses sea ice level 1 baseline requirement SI4 by conducting a sampling mission that is time-coincident with a historic Envisat track, and sea ice level 1 projected requirement SIP2f by extending sea ice baseline observations to the Canadian Archipelago. Best dates for matching the SARAL groundtracks occur on 13 March or 1 April, good choices occur on 19 and 26 March, and relatively poor choices occur on 20 and 25 March. These are driven by the geography of the groundtrack.

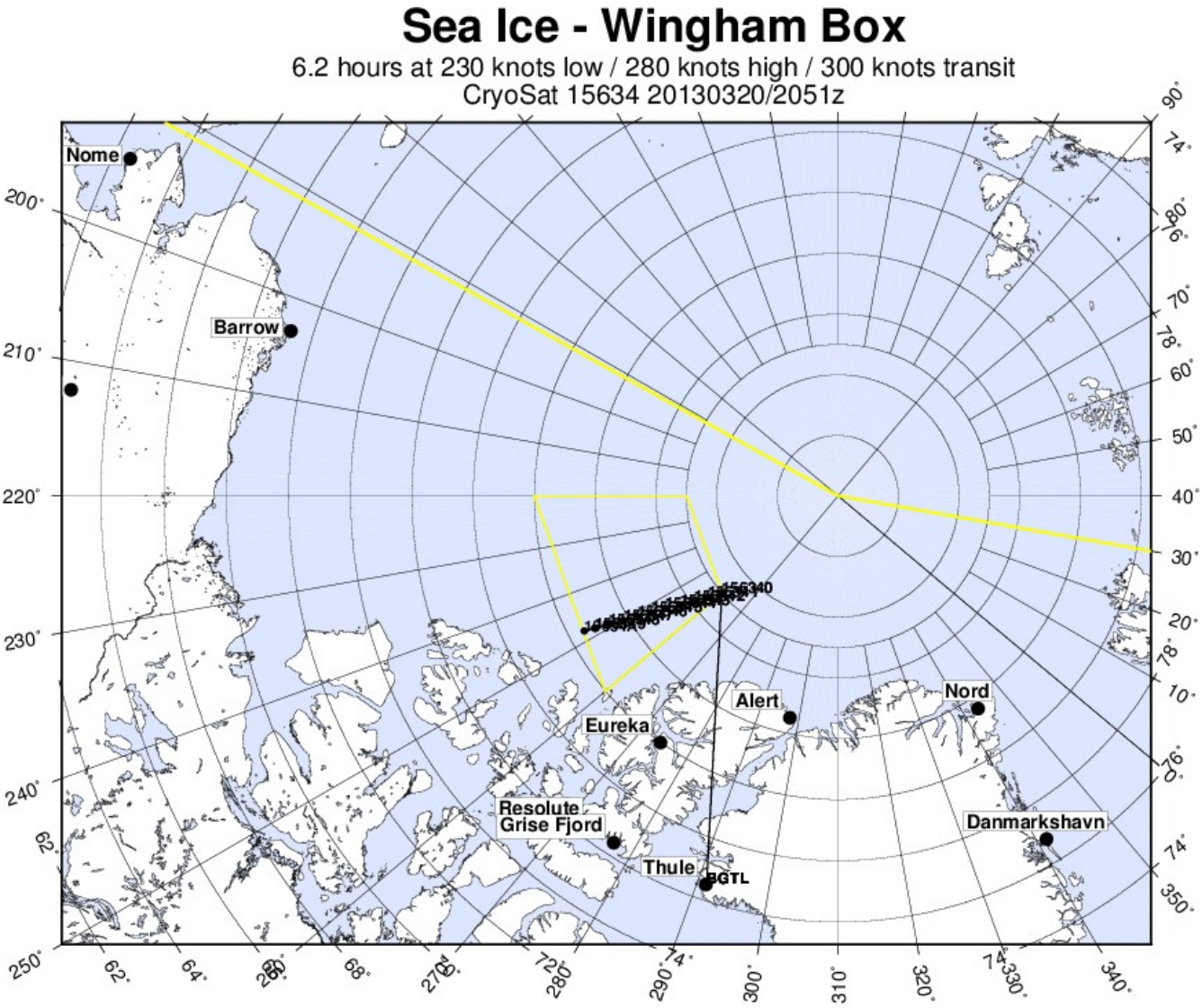
Flight Priority: medium
ICESat Tracks: none
Last Flown: 2012
Remaining Design Issues: redesign along contemporaneous (within ~6 hr) SARAL groundtrack; create latlon file



Sea Ice – Wingham Box / Thule (provisional)

This mission is flown along a near-contemporaneous (preferably within 2 hours) CryoSat-2 groundtrack within the SARin mode box of the spacecraft. The purpose is to improve understanding of the impact of off-nadir leads on CS-2 range accuracy. We fly the track in both directions, at 1500' for the pass closest to the spacecraft overpass time, and at ~15,000 for the remaining pass. The yellow box denotes where CryoSat-2 operates in SARin mode. In addition to Level 1 Requirements SI1 and SI2, this mission addresses sea ice level 1 baseline requirement SI4 by conducting a sampling mission that is time-coincident with a CryoSat track.

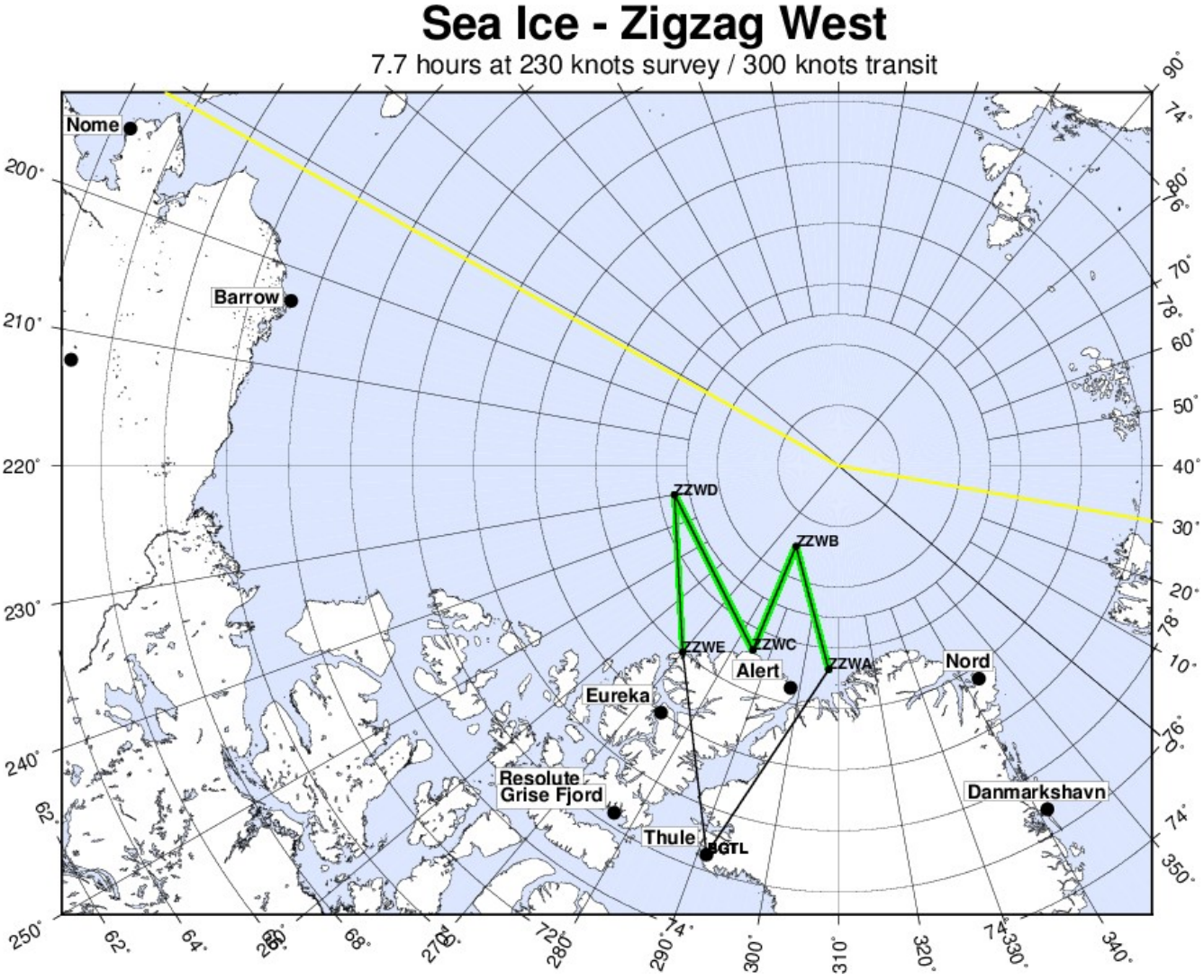
Flight Priority: low
ICESat Tracks: none
Last Flown: 2012
Remaining Design Issues: select contemporaneous CS-2 groundtrack



Sea Ice – Zigzag West / Thule (provisional)

This mission is a modified version of the similar Zigzag West flight flown in prior years. It is intended to sample the thick multi-year ice near the Ellesmere coast as well as the gradient to thinner ice closer to the pole. A nearby ascending CryoSat-2 ground track may be substituted for one of the tracks shown below if a nearly contemporaneous one is available when this flight is conducted (e.g. close to leg ZZWA/ZZWB). In addition to Level 1 Requirements SI1 and SI2, the mission addresses sea ice level 1 baseline requirement SI3b by sampling thick multi-year ice near the northern coast of Ellesmere Island and the poleward gradient towards thinner ice. **This mission can be flown during the May Thule deployment if it is not flown in March.**

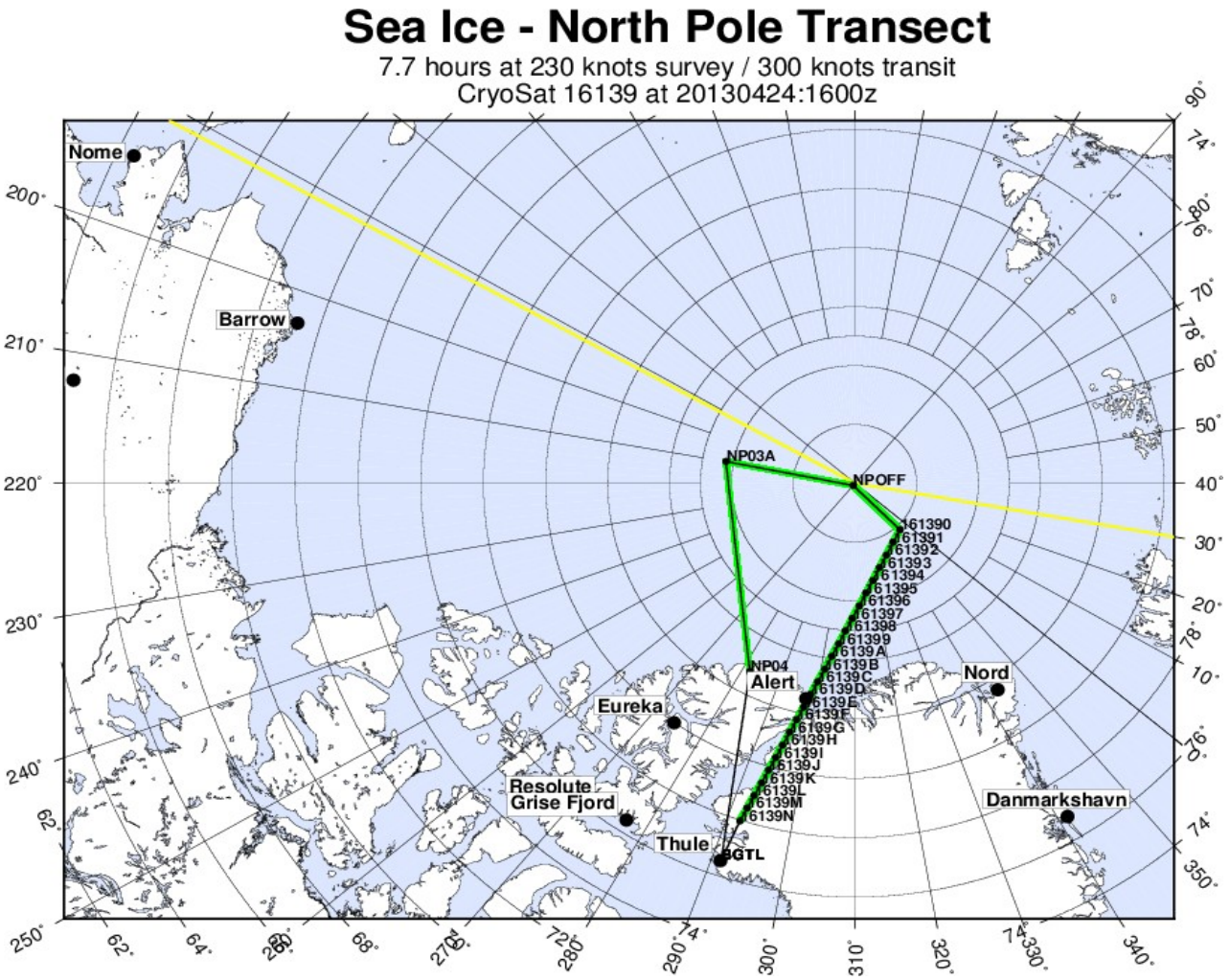
Flight Priority: high (paired with North Pole Transect) – this is the lower priority of the two, and drops to medium if North Pole Transect is flown with a CryoSat-2 underflight incorporated)
ICESat Tracks: none
Last Flown: 2012
Remaining Design Issues: select contemporaneous, nearby ascending CS-2 groundtrack if available and coordinate with CryoVex/Alert if possible (operating 25-28 March)



Sea Ice – North Pole Transect / Thule (provisional)

This mission is a repeat or near-repeat of a 2013 OIB flight. The intention is to sample ice in the vicinity of the Pole and also the gradient of that ice between the Pole and Ellesmere Island. This area had been undersampled by OIB prior to 2012. A nearby descending CryoSat-2 ground track may be substituted for one of the tracks shown below if a nearly contemporaneous one is available when this flight is conducted, preferably one close to the 10346 line. In addition to Level-1 Requirements SI1 and SI2, this mission addresses sea ice level 1 projected requirement SIP2a by extending sea ice baseline observations to the North Pole region, and sea ice level 1 baseline requirement SI4 by conducting a sampling mission that is time-coincident with a CryoSat-2 track. **This mission can be flown during the May Thule deployment if it is not flown in March.**

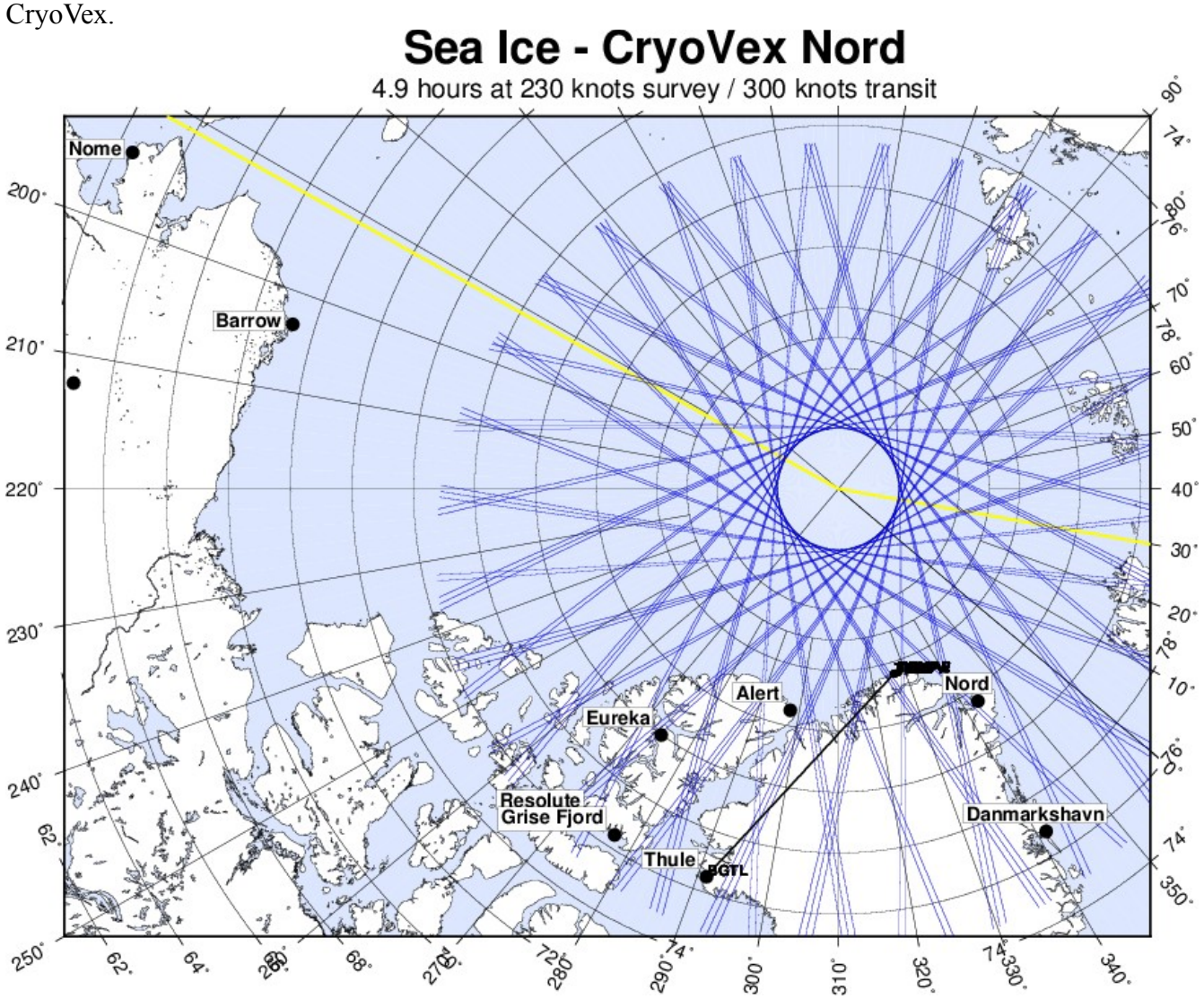
Flight Priority: high (paired with Zigzag West, but this flight stays high priority regardless)
ICESat Tracks: none
Last Flown: 2013
Remaining Design Issues: select contemporaneous, nearby descending CS-2 groundtrack if available and coordinate with CryoVex/Alert if possible (operating 25-28 March)



Sea Ice – CryoVex Nord / Thule (provisional)

This is a new mission, designed exclusively for the purpose of gathering coincident data (a) over the CryoVex sea ice camp near Cape Morris Jessup, and (b) under a time-coincident CryoSat-2 orbit in the same vicinity, and in coordination with CryoVex aircraft. Note that (b) drops in priority if the CS2 underflight has been successfully accomplished in conjunction with the Zigzag West or North Pole transect missions. The CryoVex effort in this area is scheduled to take place from 30 March through 1 April 2014.

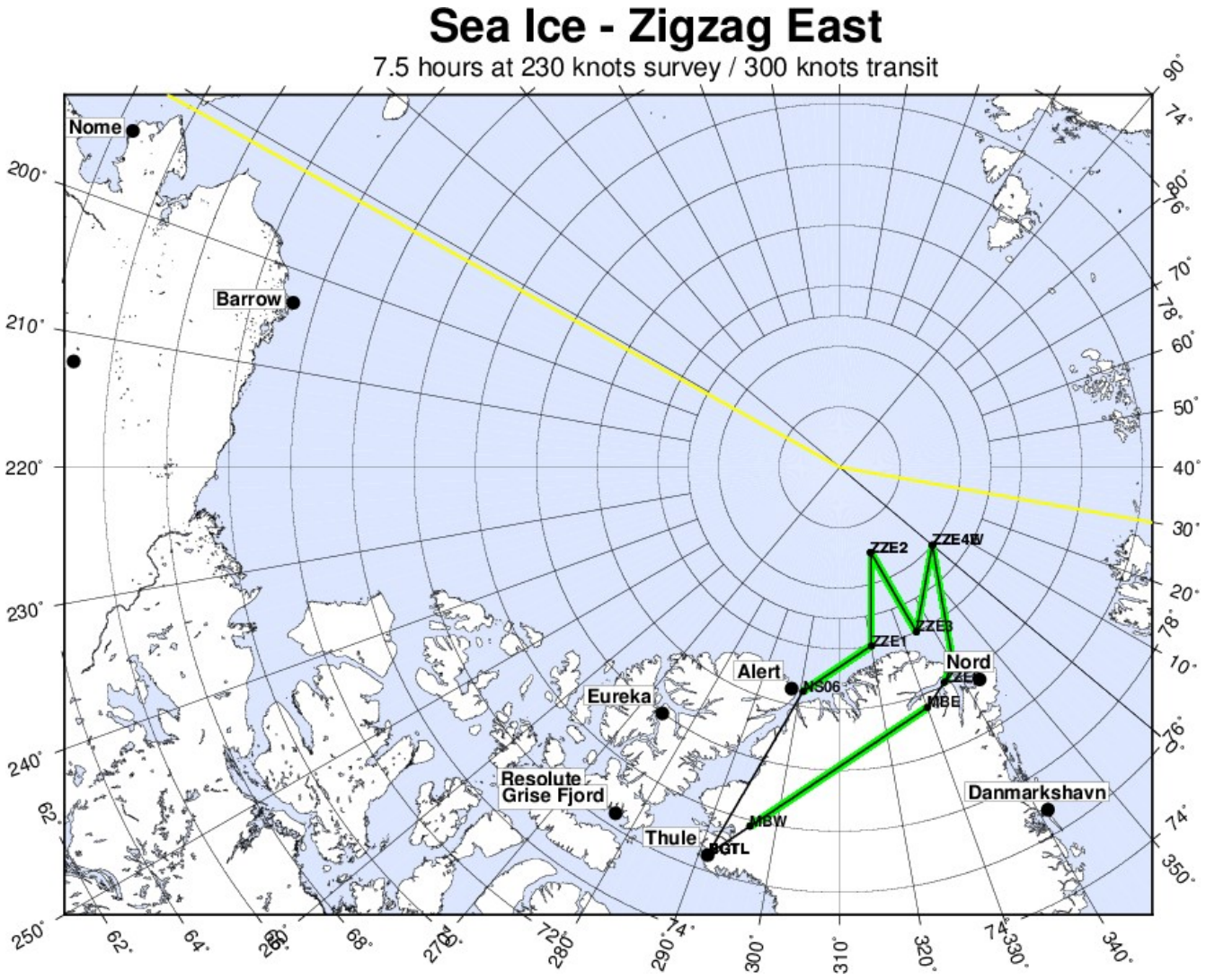
Flight Priority: high
ICESat Tracks: none
Last Flown: new flight
Remaining Design Issues: Refine camp coordinates and design overflight (at least 10-11 passes), overfly lead within 5 km if one exists for calibration, overfly groomed runway for calibration, and overfly the survey line once at right angle; Select CryoSat-2 groundtracks in coordination with CryoVex.



Sea Ice – Zigzag East / Thule (provisional)

This mission is a modified version of the similar Zigzag East flight flown in prior years. It is intended to sample the thick multi-year ice near the Greenland coast as well as the gradient to thinner ice closer to the pole. In addition to Level 1 Requirements SI1 and SI2, the mission addresses sea ice level 1 baseline requirement SI3b by sampling thick multi-year ice near the northern coast of Greenland and the poleward gradient towards thinner ice. During the high-altitude transit across northern Greenland, we also collect multi-beam MCoRDS data, in conjunction with the same line on the Nansen Gap and Giles Gateway flights.

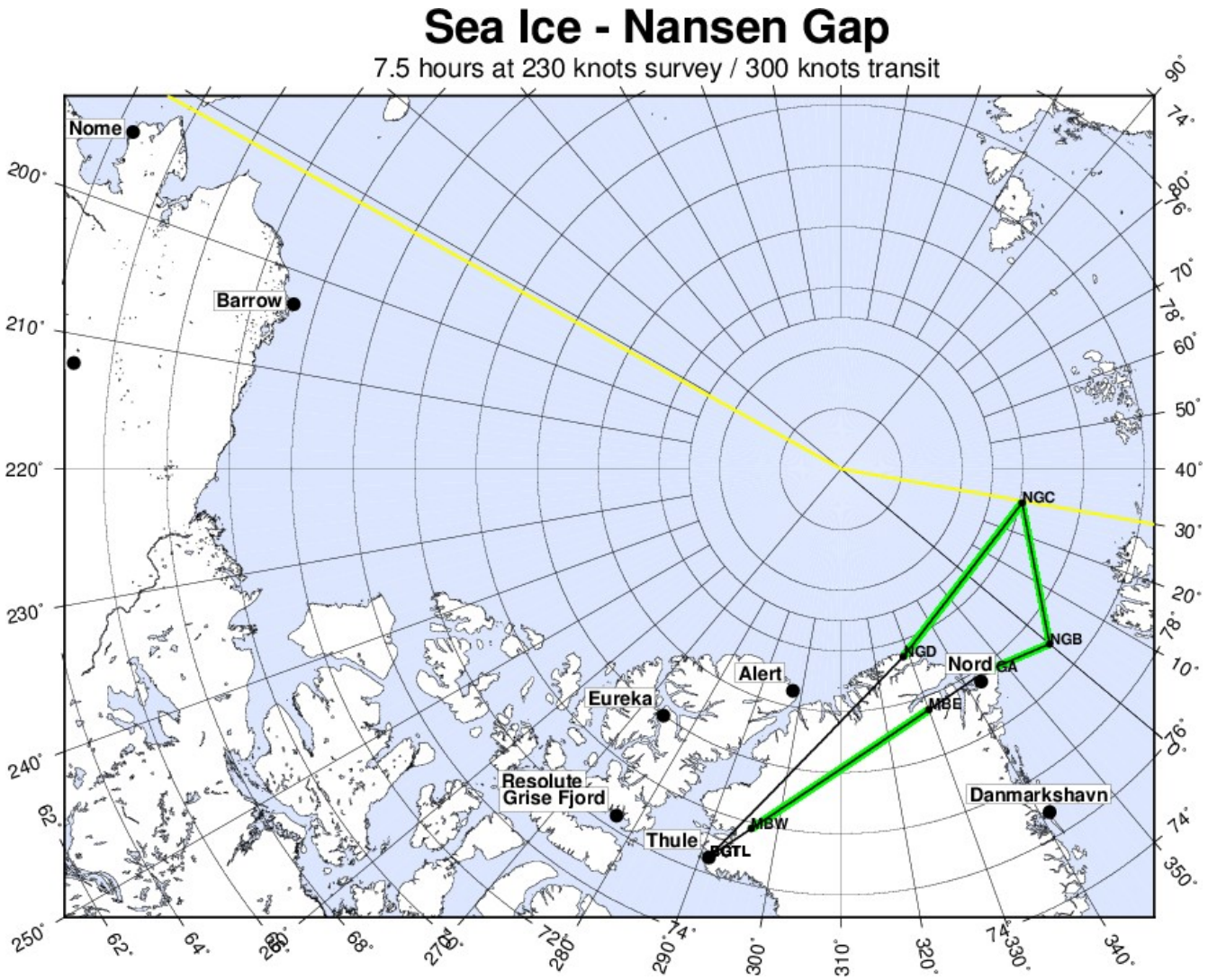
Flight Priority: high
ICESat Tracks: none
Last Flown: 2013
Remaining Design Issues: none



Sea Ice – Nansen Gap / Thule (provisional)

This is a modified version of the Fram Gateway missions flown in several of the past several years. It differs from them in that it transits to and from the area of the Fram Strait at high-altitude, leaving more time to sample ice farther north and east than in prior years. In addition to Level 1 Requirements SI1 and SI2, this mission addresses sea ice level 1 baseline requirements SI3c and d by sampling sea ice north of Fram Strait. During the high-altitude transit across northern Greenland, we also collect multi-beam MCoRDS data, in conjunction with the same line on the Zigzag East and Giles Gateway flights.

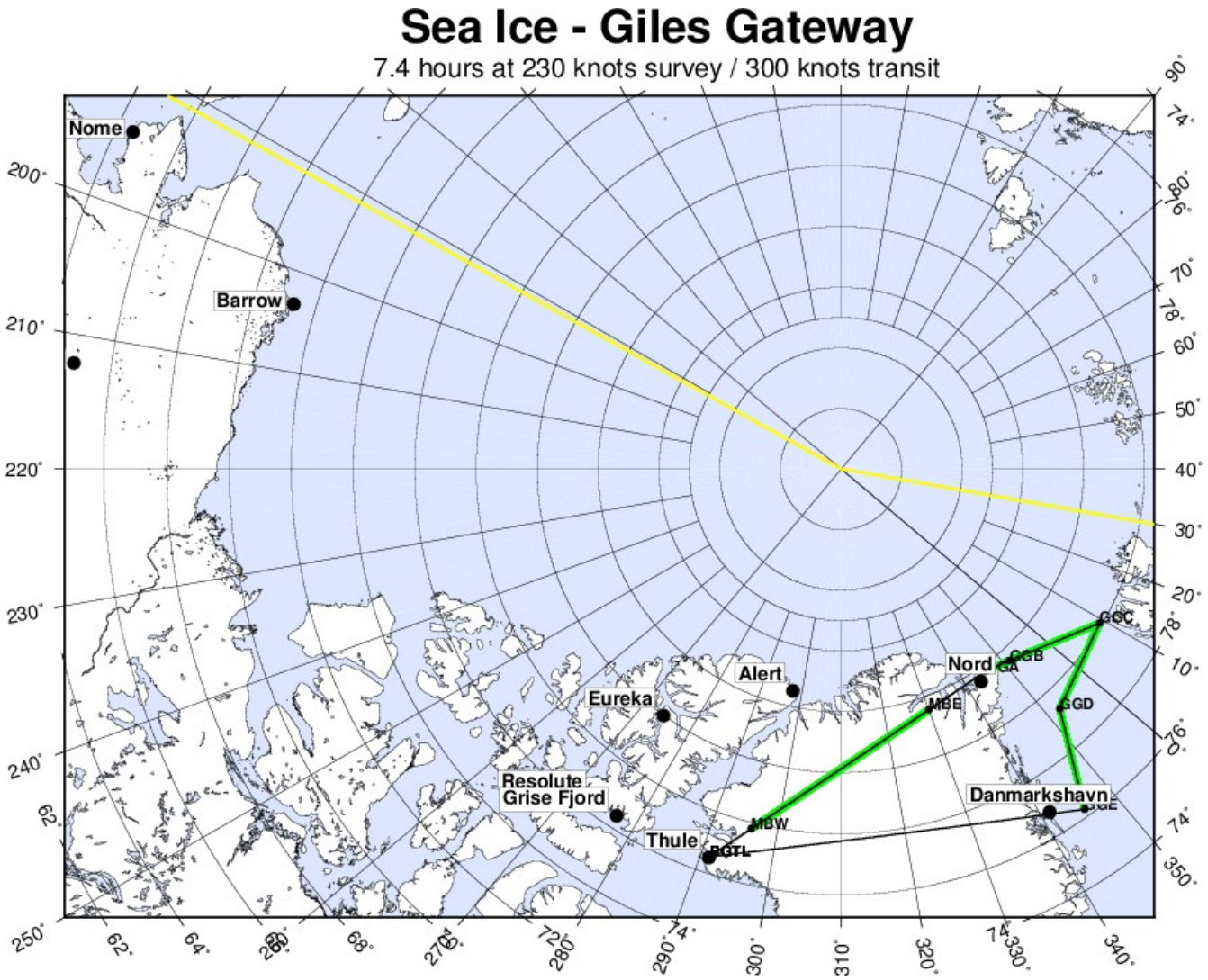
Flight Priority: high
ICESat Tracks: none
Last Flown: 2012
Remaining Design Issues: none



Sea Ice – Giles Gateway / Thule (provisional)

This is a new mission. It is designed to sample ice passing through the Fram "gateway" between northeast Greenland and Svalbard, and to sample ice south of the gateway as it is transported south along the Greenland coast. In addition to Level 1 Requirements SI1 and SI2, this mission addresses sea ice level 1 baseline requirements SI3c and d by sampling sea ice in and south of Fram Strait. During the high-altitude transit across northern Greenland, we also collect multi-beam MCoRDS data, in conjunction with the same line on the Zigzag East and Nansen Gap flights.

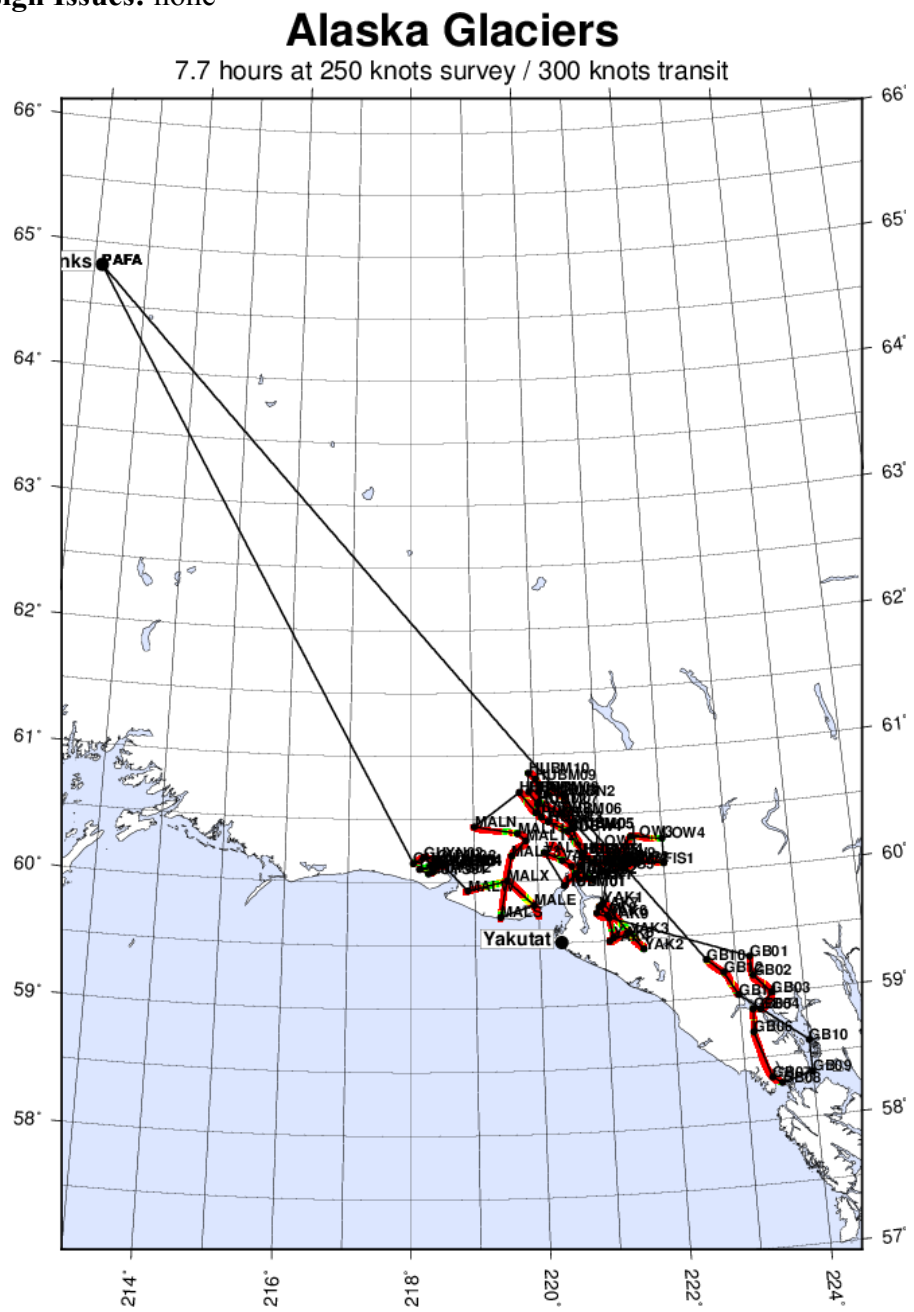
Flight Priority: medium
ICESat Tracks: none
Last Flown: new flight
Remaining Design Issues: none



Land Ice – Alaska Glaciers / Fairbanks

This mission repeats dh/dt survey lines over in the St. Elias mountains and in the Glacier Bay area which were surveyed by ATM in 2005, and by the University of Alaska a number of times. Specific glaciers we survey are Hubbard, Valerie, Variegated, Guyot, the Yakutat Icefield, Fisher, Lowell, and three glaciers in Glacier Bay National Park. This mission is intended to be flown only if the aircraft is "stranded" in Fairbanks during the sea ice portion of the survey, and unable to transit back to Thule due to weather across the western Arctic basin.

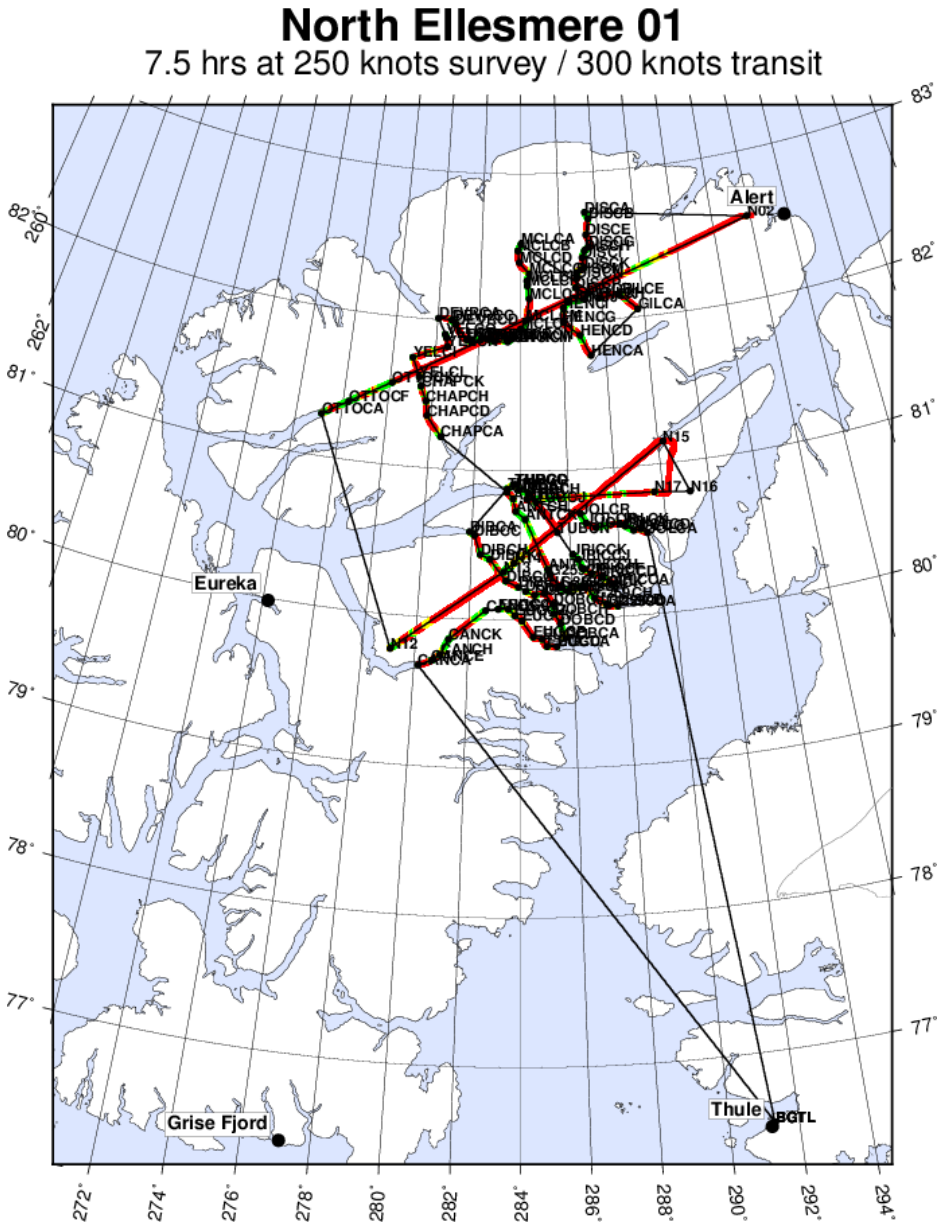
Flight Priority: low(?)
ICESat Track: none
Last Flown: 2005
Remaining Design Issues: none



Land Ice – North Ellesmere 01 / Thule

This is a new mission, designed as part of OIB's multi-year dh/dt repeat strategy, and based both on the ATM surveys of the Canadian ice caps dating back to 1995, and to flightlines designed with Dave Burgess and Martin Sharp as part of a CSA/NASA agreement in 2014 and flown that same year. This mission concentrates on the northern Ellesmere ice field and on the Agassiz Ice Cap in east-central Ellesmere. For the northern ice field, we fly a historical ATM line traversing the ice from southwest to northeast plus centerlines of the major glaciers draining the ice field. We also fly a number of such glaciers on Agassiz, along with a pair of historical ATM lines.

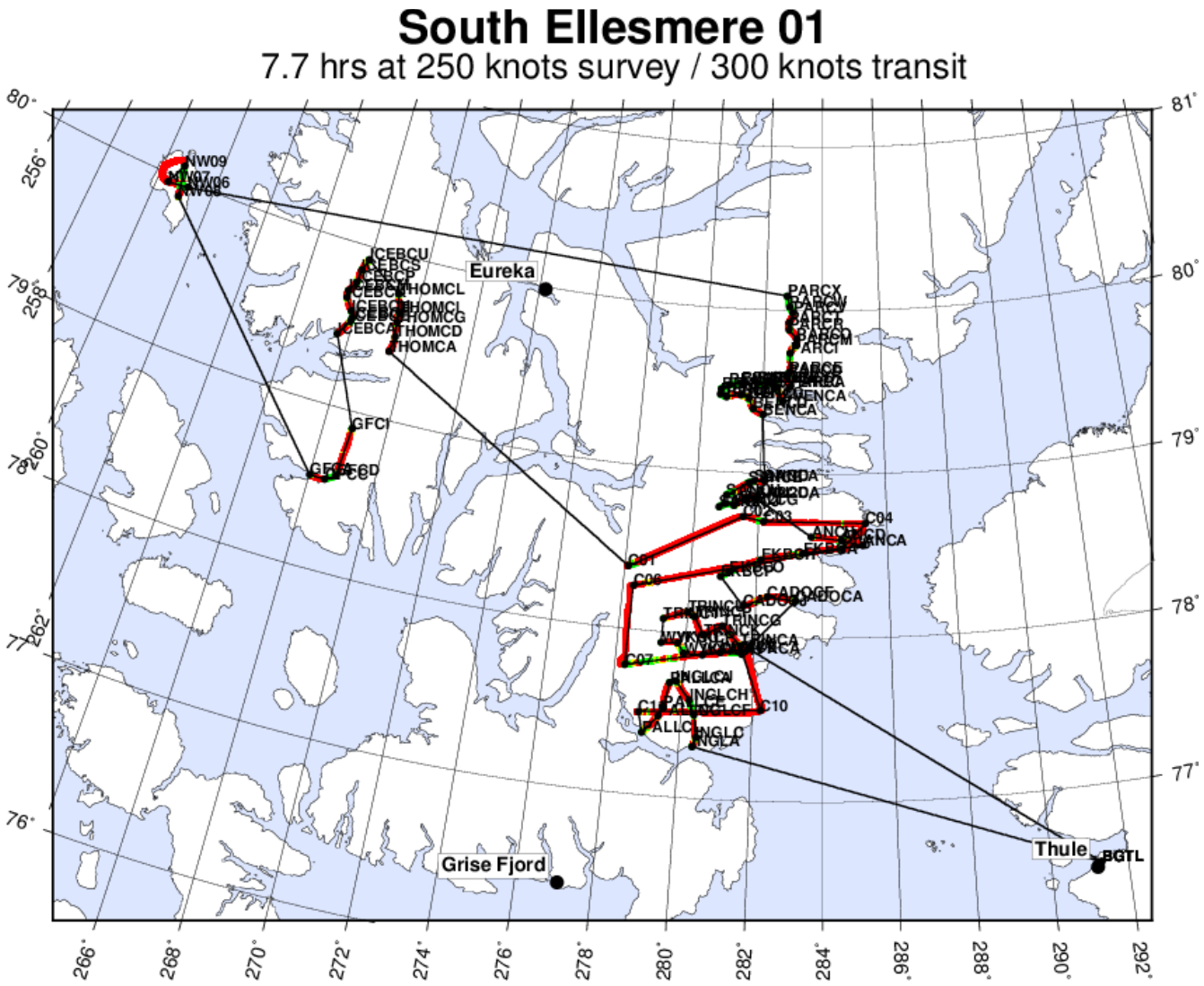
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: most in 2014, the historical Agassiz lines in 2012
Remaining Design Issues: none



Land Ice – South Ellesmere 01 / Thule

This is a new mission, designed as part of OIB's multi-year dh/dt repeat strategy, and based both on the ATM surveys of the Canadian ice caps dating back to 1995, and to flightlines designed with Dave Burgess and Martin Sharp as part of a CSA/NASA agreement in 2014 and flown that same year. This mission surveys the Prince of Wales ice cap on southeastern Ellesmere, including a number of glacier centerlines from the 2014 effort and four transects from the historical ATM lines, three glacier centerlines on the southern Agassiz ice cap, three on Axel Heiberg Island, and two crossing tracks in the Meighen Island ice cap.

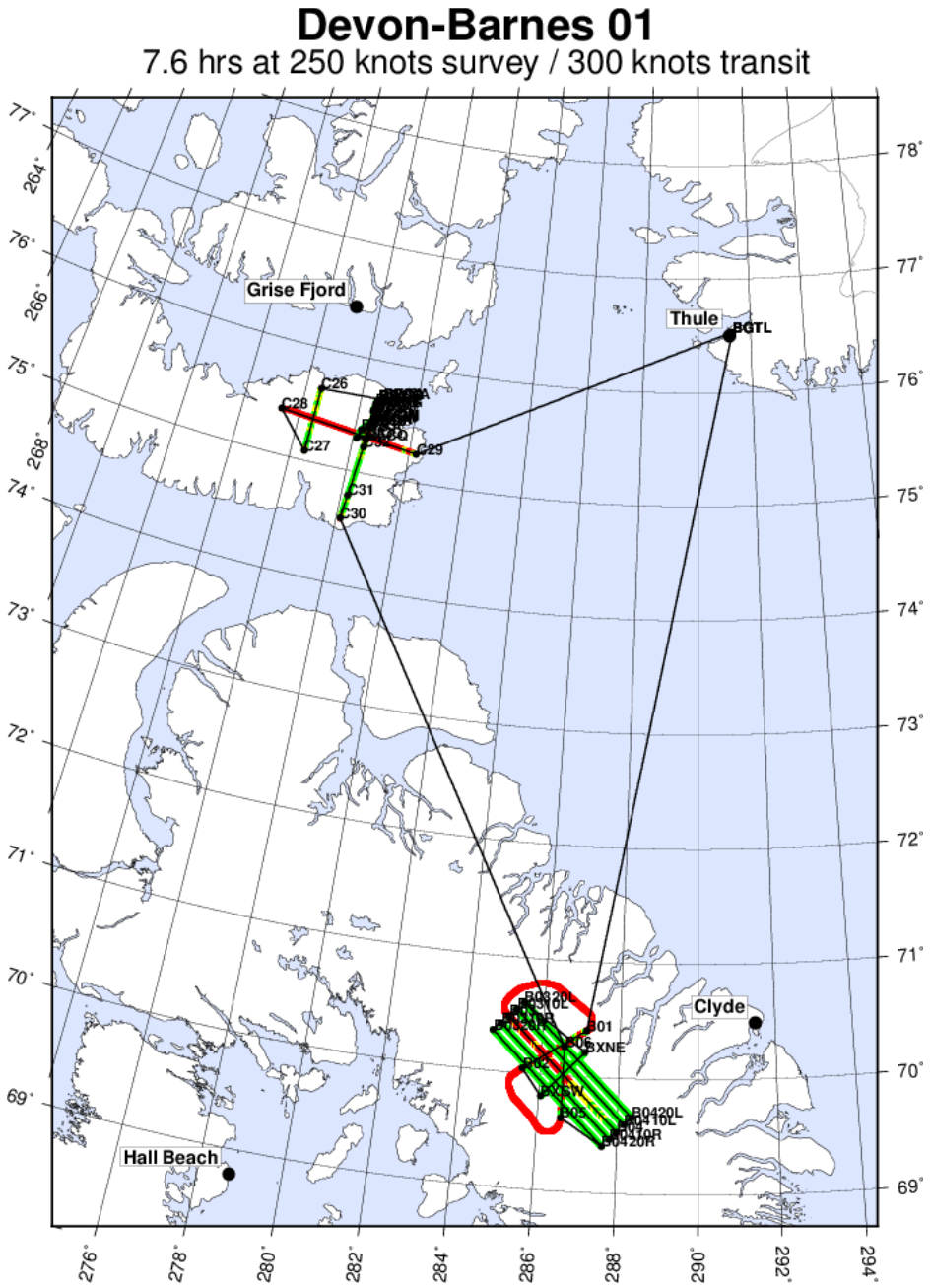
Flight Priority: medium(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: centerlines in 2014, historical Meighen and Prince of Wales lines in 2012
Remaining Design Issues: none



Land Ice – Devon-Barnes 01 / Thule

This mission repeats survey lines over the Barnes and Devon Ice Caps previously surveyed by the ATM/KU teams in 1995, 2000, and 2005, and adds several new lines over the Barnes Ice Cap. We also fly the East and West channels of the Belcher Glaciers, draining the northeastern Devon Ice Cap.

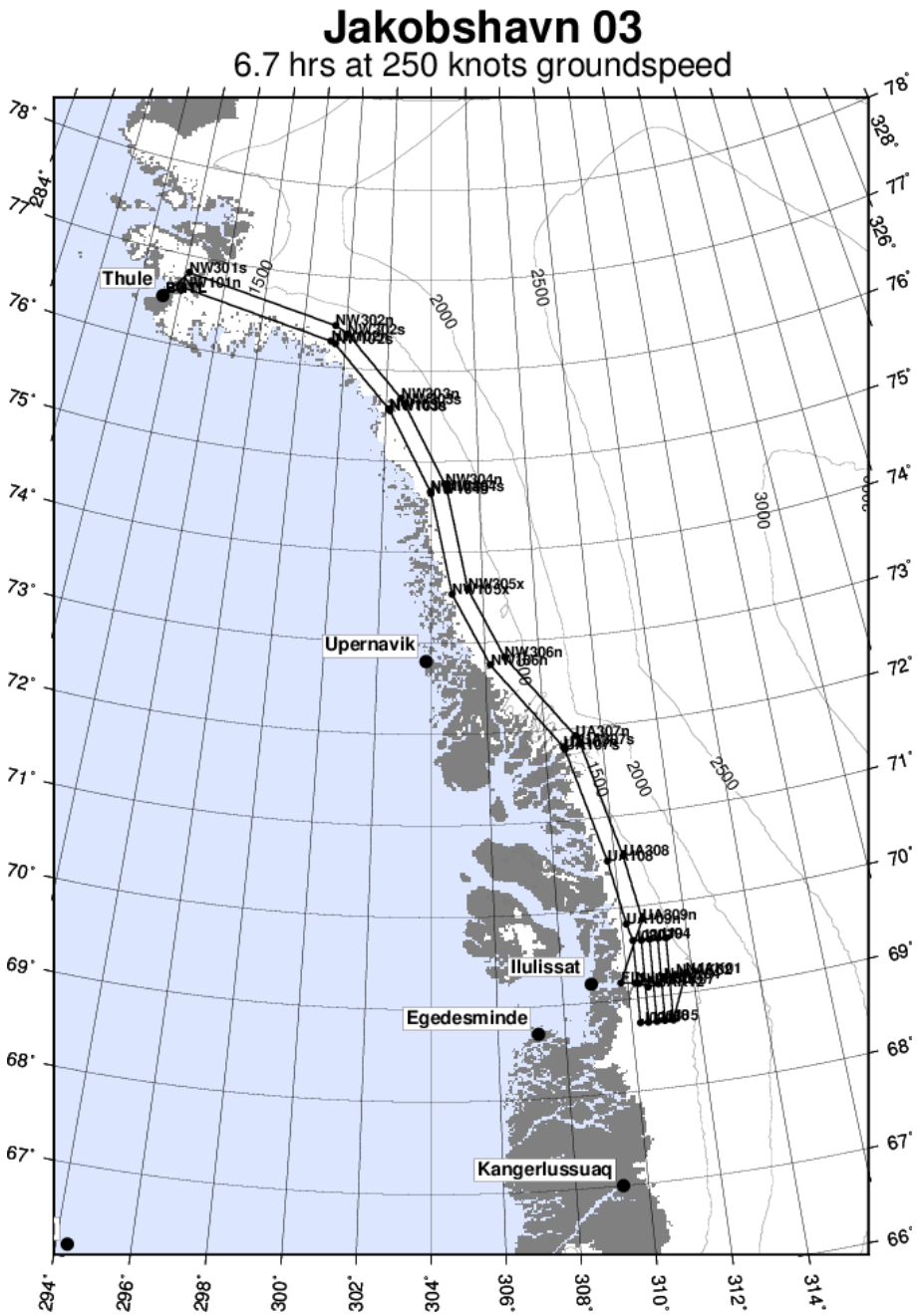
Flight Priority: high(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2011
Remaining Design Issues: none



Land Ice – Jakobshavn 03 / Thule

This is a new mission intended to assess the performance of the MCoRDS depth sounder on a challenging target, in this case Jakobshavn Glacier, prior to the beginning of the melt season. This mission should be flown in the March Thule operations window, preferably as early as possible. We fly the centerline of Jakobshavn plus five of the lower north-south lines of the glacier's 10 km grid. We transit to and from the area along lower coast-parallel lines from the Northwest Coastal and Umanaq grids, crossing the channels of many major outlet glaciers along the route.

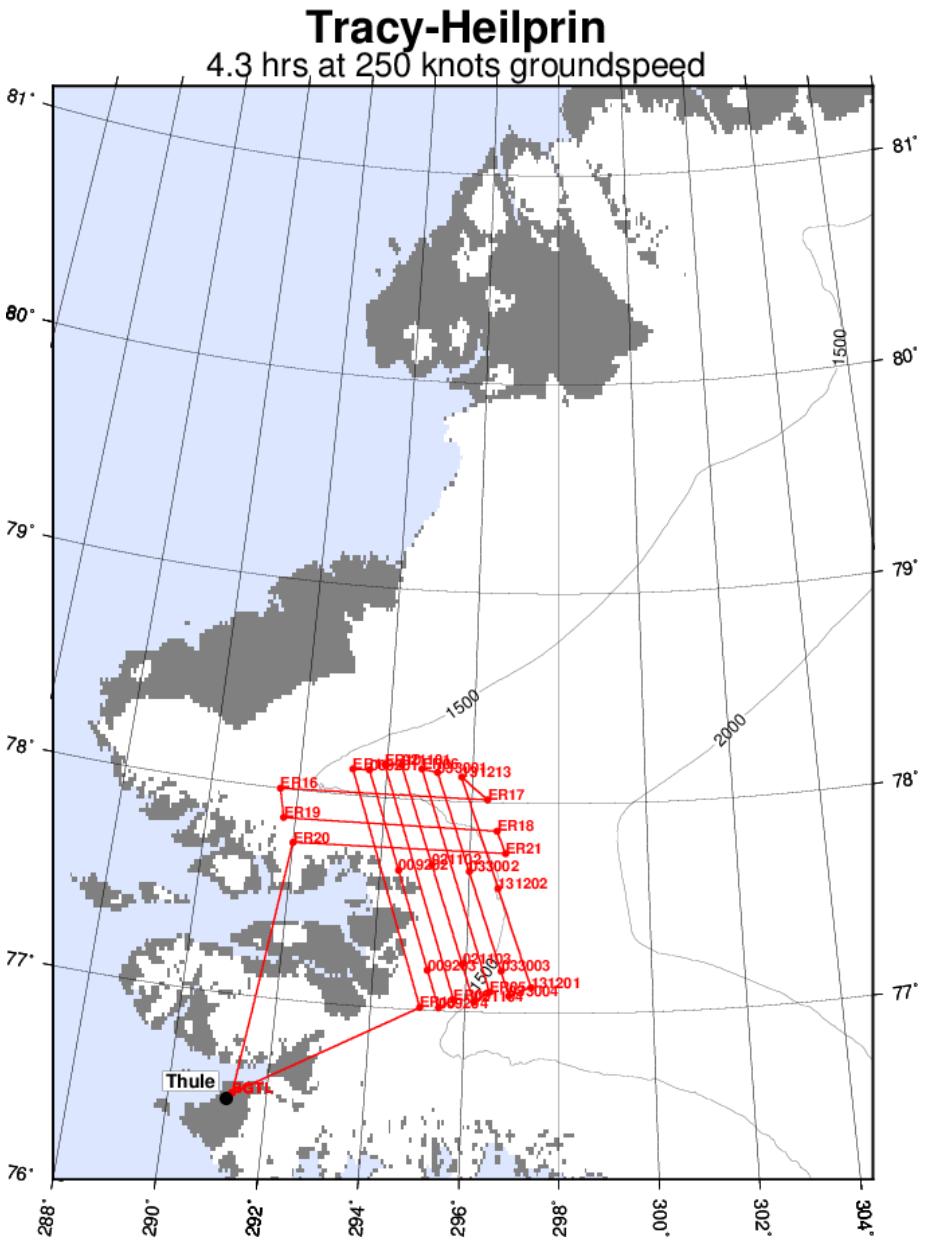
Flight Priority: TBD
IceSat-1 Track: none
Last Flown: new flight
Remaining Design Issues: none



Land Ice – Tracy-Heilprin (provisional) / Thule

This is a new mission designed to supplement existing bedrock mapping in the area of Tracy and Heilprin Glaciers. As currently conceived it is a short flight and can be either supplemented with new flightlines in the area if these materialize, or broken up and the pieces added into two or three other missions in this area.

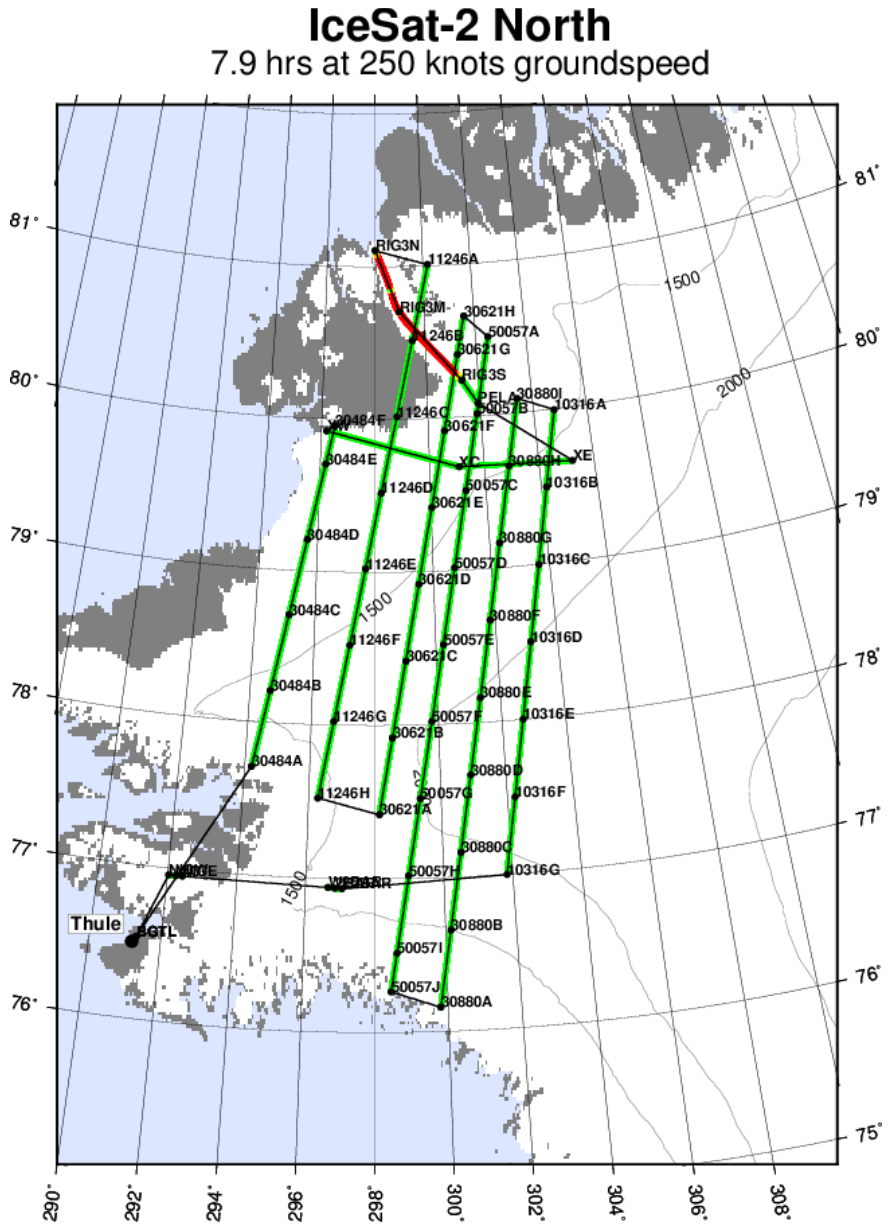
Flight Priority: TBD
IceSat-1 Track: 0092,0211,0330,1312
Last Flown: new flight
Remaining Design Issues: none



Land Ice – IceSat-2 North / Thule

This mission is designed to overfly planned IceSat-2 ground tracks over a wide range of ice regimes near Thule. We center some of the flightlines on each of three beam pairs (left, nadir and right) in turn, sampling at least one of each beam pair during this mission. The east-west crossing line is designed to capture as many ascending/descending crossovers as possible. We also fly a particular flowline of Petermann Glacier which has been sampled intermittently during the ATM and OIB eras, overflying two GCNet sites in the process. Finally we overfly two core sites near Thule, known as "2Barrels" and "North Ice Cap".

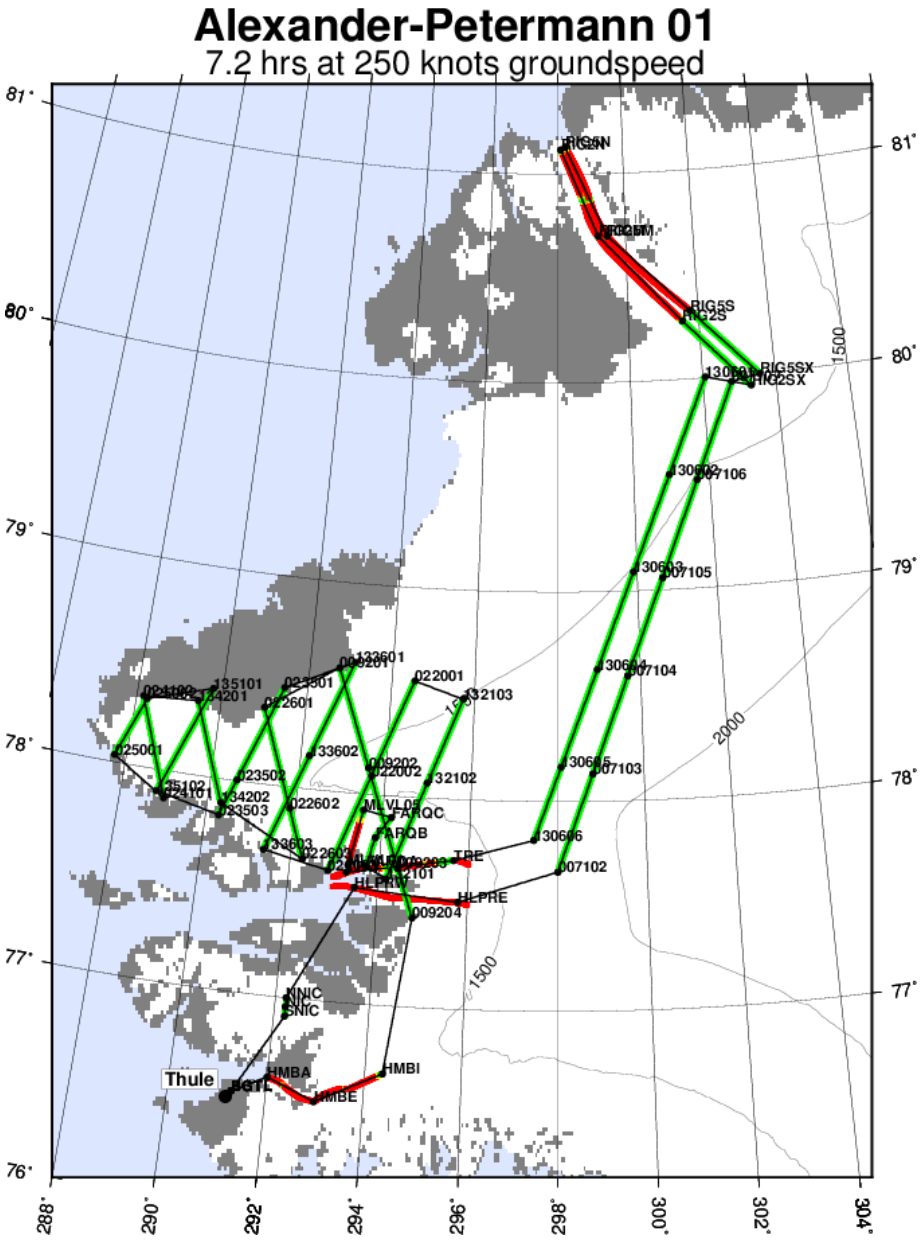
Flight Priority: baseline (annual repeat flight)
IceSat-2 Track: 0484,1246,0621,0057,0880,0316
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Alexander-Petermann 01 / Thule

This mission reflies most of the Cape Alexander IceSat-1 groundtracks flown in 2012, reflies two flowlines of Petermann Glacier which OIB flies almost every year., reflies the centerlines of Melville, Tracy and Heilprin Glaciers, and flies new flowlines of Farquhar Glacier and Harald Moltke Brae.

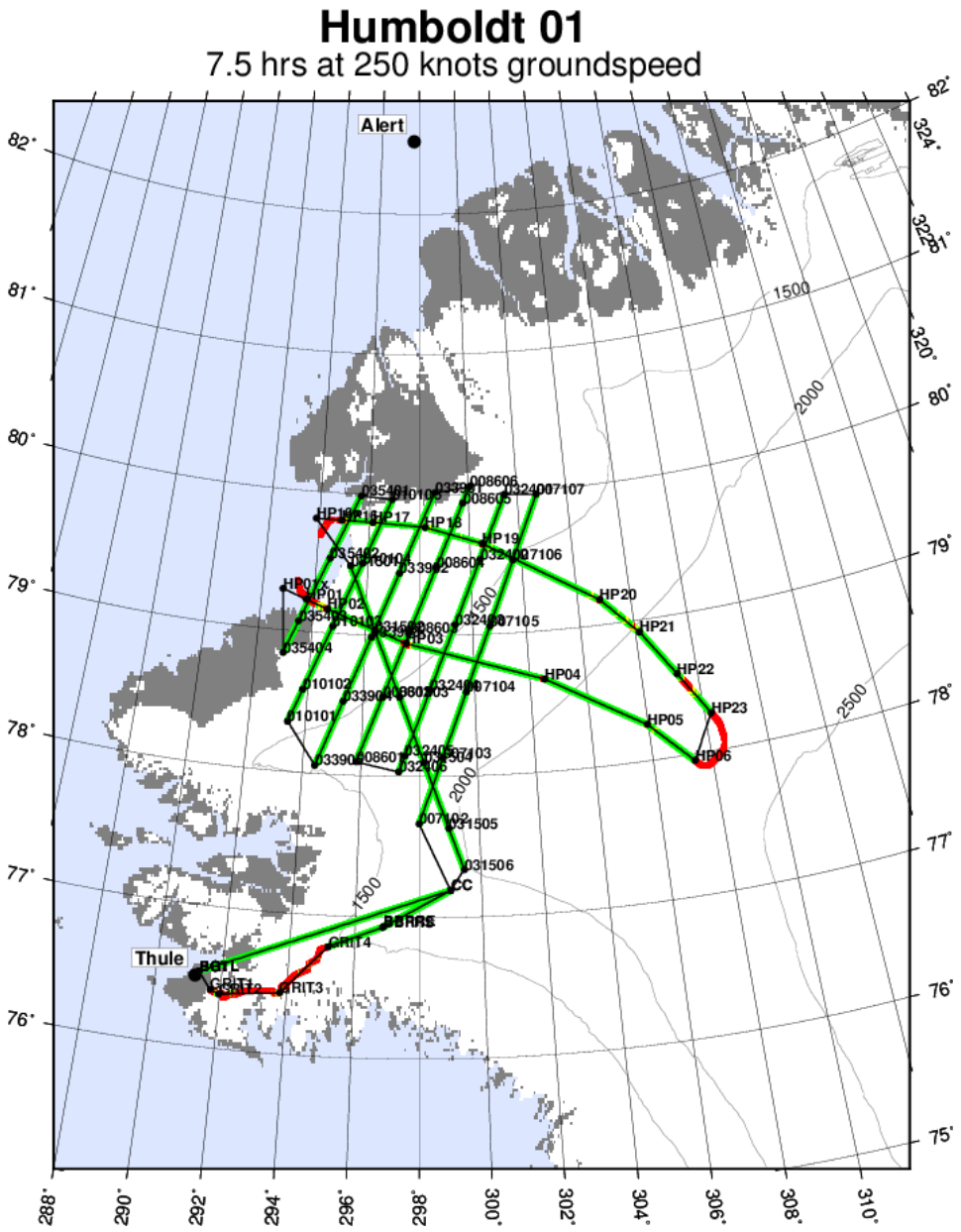
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: 1306,0071
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Humboldt 01 / Thule

This mission is designed to repeat two historical ATM lines which follow flowlines down the Humboldt Glacier, and several descending ICESat tracks which parallel the terminus. We also fly the GrIT traverse route between Thule and Camp Century, as well as an associated and collocated field site known as “2 Barrels”.

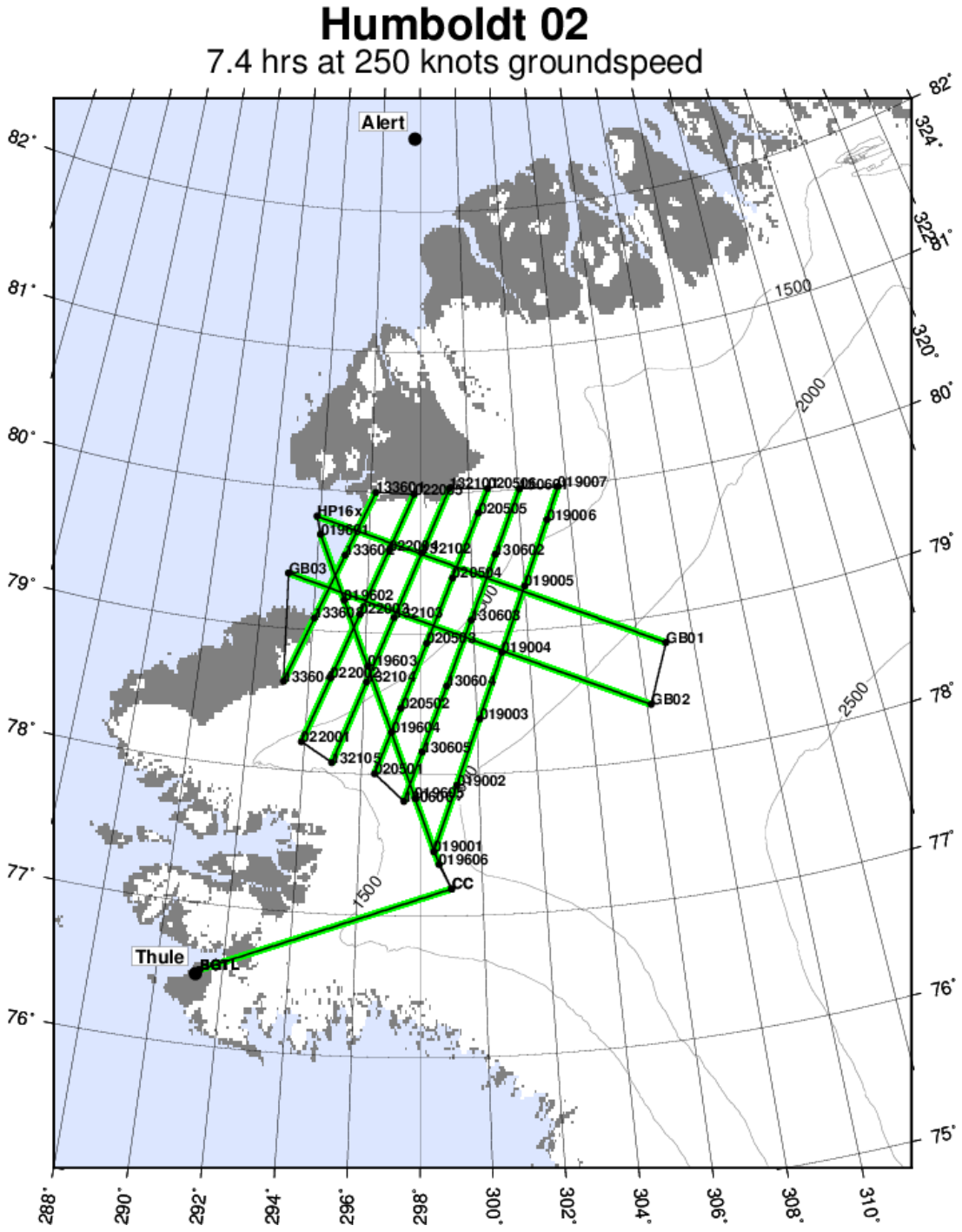
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: 0071,0324,0086,0339,0101,0354,0315
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Humboldt 02 / Thule

This is a new mission, designed to establish two new along-flow lines and interlace the ICESat lines flown in Humboldt 01 with the intervening ICESat tracks.

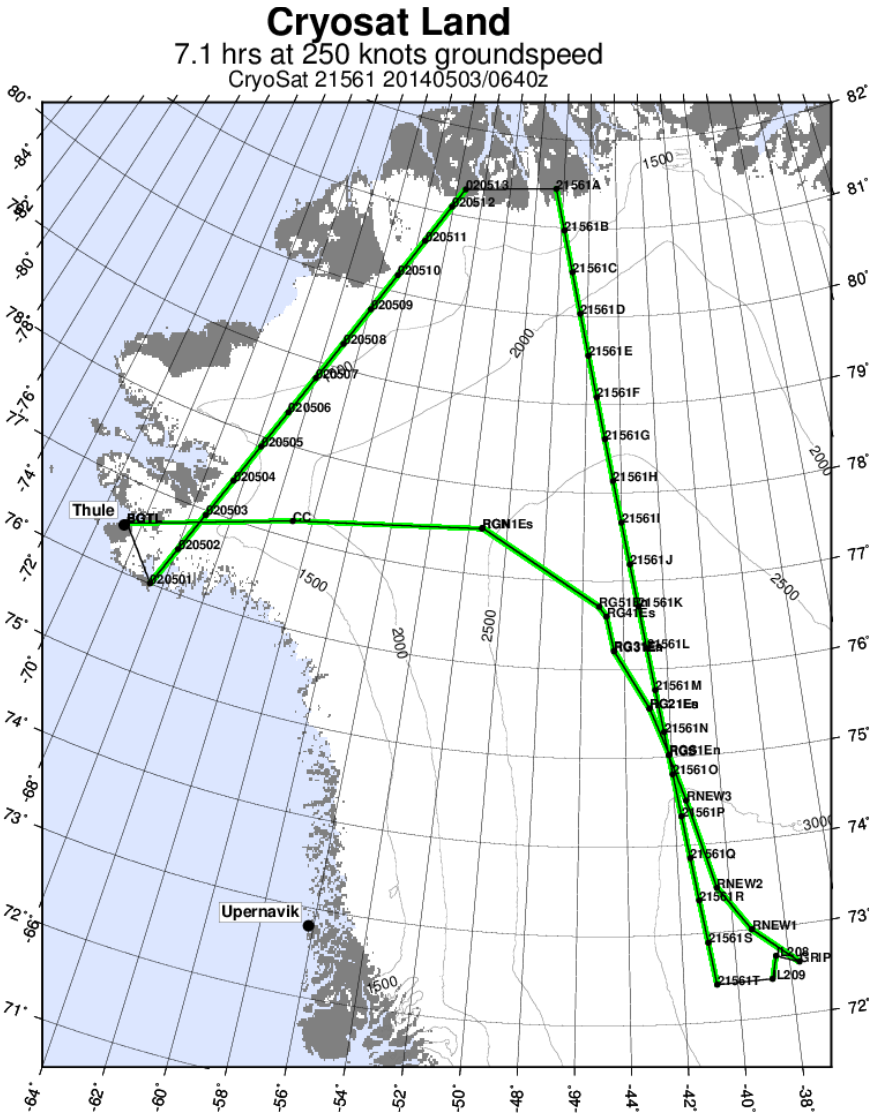
Flight Priority: low(?)
ICESat Track: 0190,1306,0205,1321,0220,1336,0196
Last Flown: new flight
Remaining Design Issues: none



Land Ice – CryoSat Land / Thule

This mission occupies a CryoSat ground track over northern Greenland, an ICESat track, and a line connecting the GRIP, NGRIP, NEEM and Camp Century drill sites. It also overflies the ICESat 0412 calibration site at Summit. We choose this area for the CryoSat track because the ground track is approximately orthogonal to the contour lines of the ice sheet, making cross-track placement of the CryoSat footprint more likely to fall at an easily predictable place – nadir. The exact CryoSat track will be selected to be contemporaneous with our flight to within a few days. The CryoSat track portion of the flight should be flown at an AGL altitude of at least 10,000 ft, in order to broaden the ATM swath to better capture the spacecraft's footprint as it wanders in the cross-track direction due to topography.

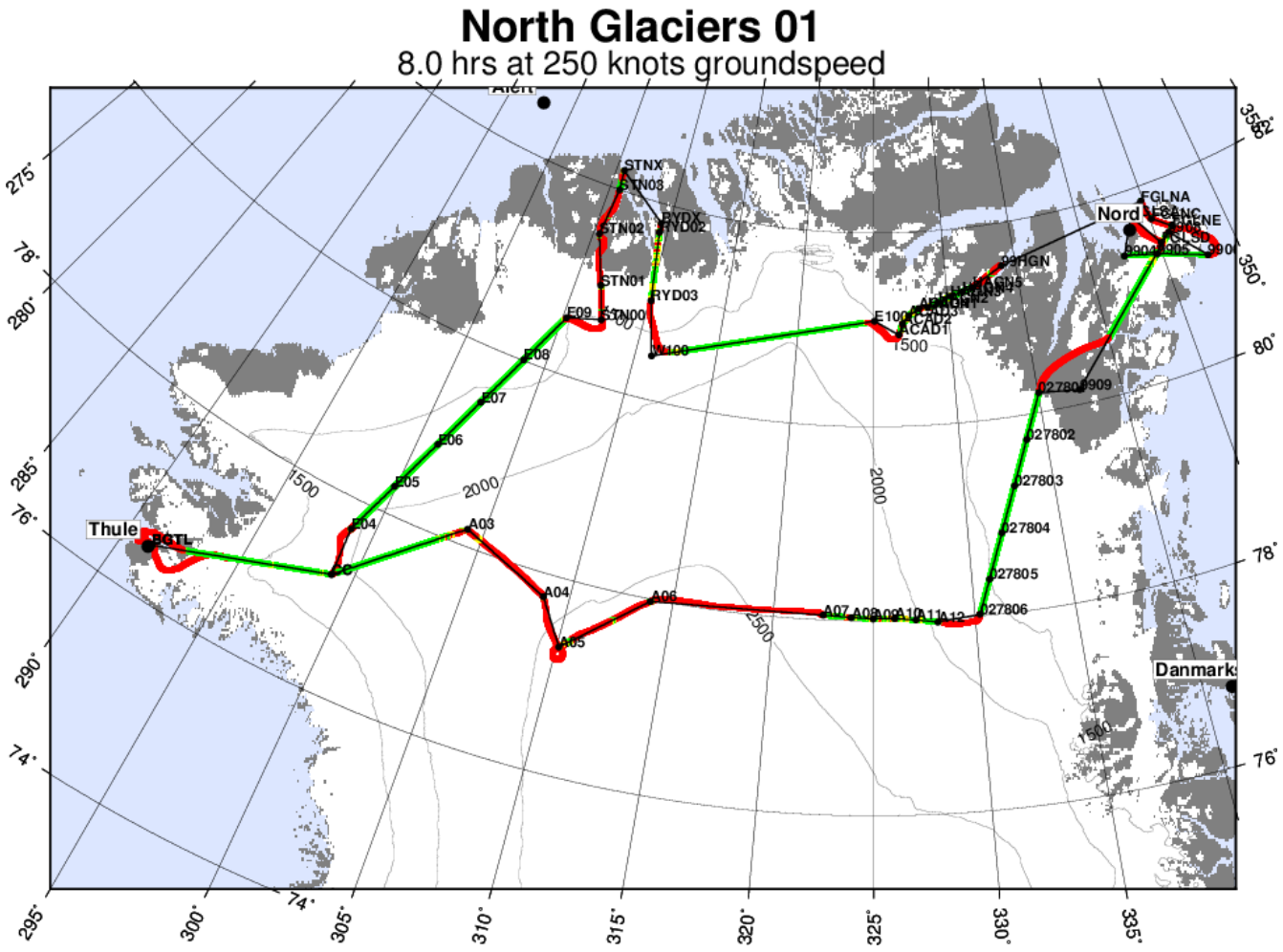
Flight Priority: high(?)
ICESat Track: 0205
Last Flown: 2014
Remaining Design Issues: none



Land Ice – North Glaciers 01 / Thule

This mission is designed to resurvey historical ATM longitudinal surveys of several glaciers in northern Greenland, including Steensby, Ryder, and Hagen Glaciers. The maneuver connecting lower Steensby and Ryder glaciers has been modified to collect straight-line data over the fjords for better gravity data. It also re-occupies ATM lines on the Flade Ice Cap, near Station Nord, and returns to Thule along the British North Greenland Expedition traverse line, which was also flown by ATM in 2002. We also add two new glacier centerlines for small glaciers draining the Flade Isblink.

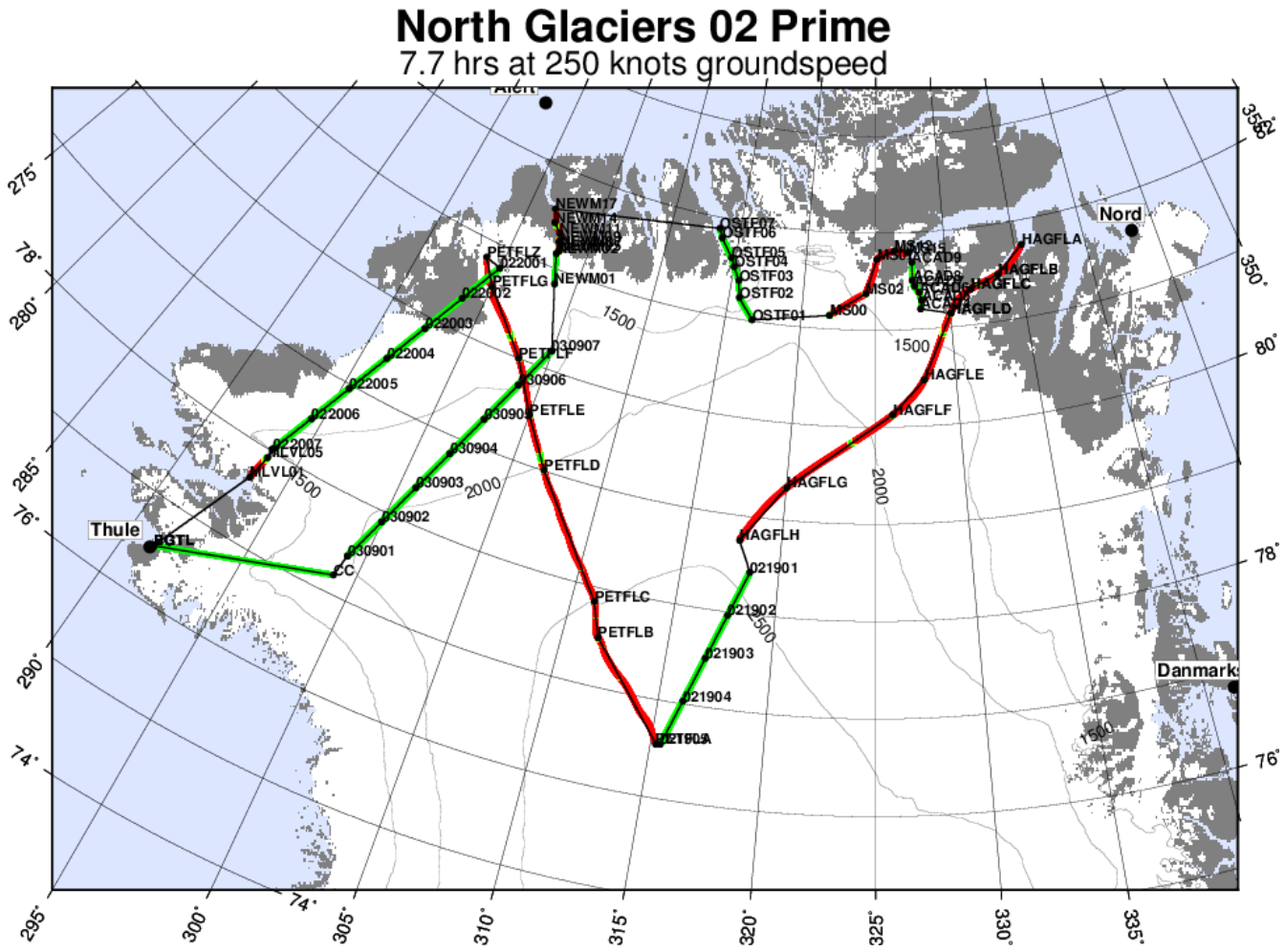
Flight Priority: medium(?) (multi-year repeat flight)
ICESat Track: 0278
Last Flown: 2013
Remaining Design Issues: none



Land Ice – North Glaciers 02 Prime / Thule

This mission is designed to resurvey a historical ATM longitudinal survey of Academy Glacier, plus several other glaciers. These include Ostfjord, Maria Sophia, and a (possibly unnamed) glacier emptying into Newman Bay. We also survey flowlines of the Hagen and Petermann glaciers all the way from their termini to the ice divide.

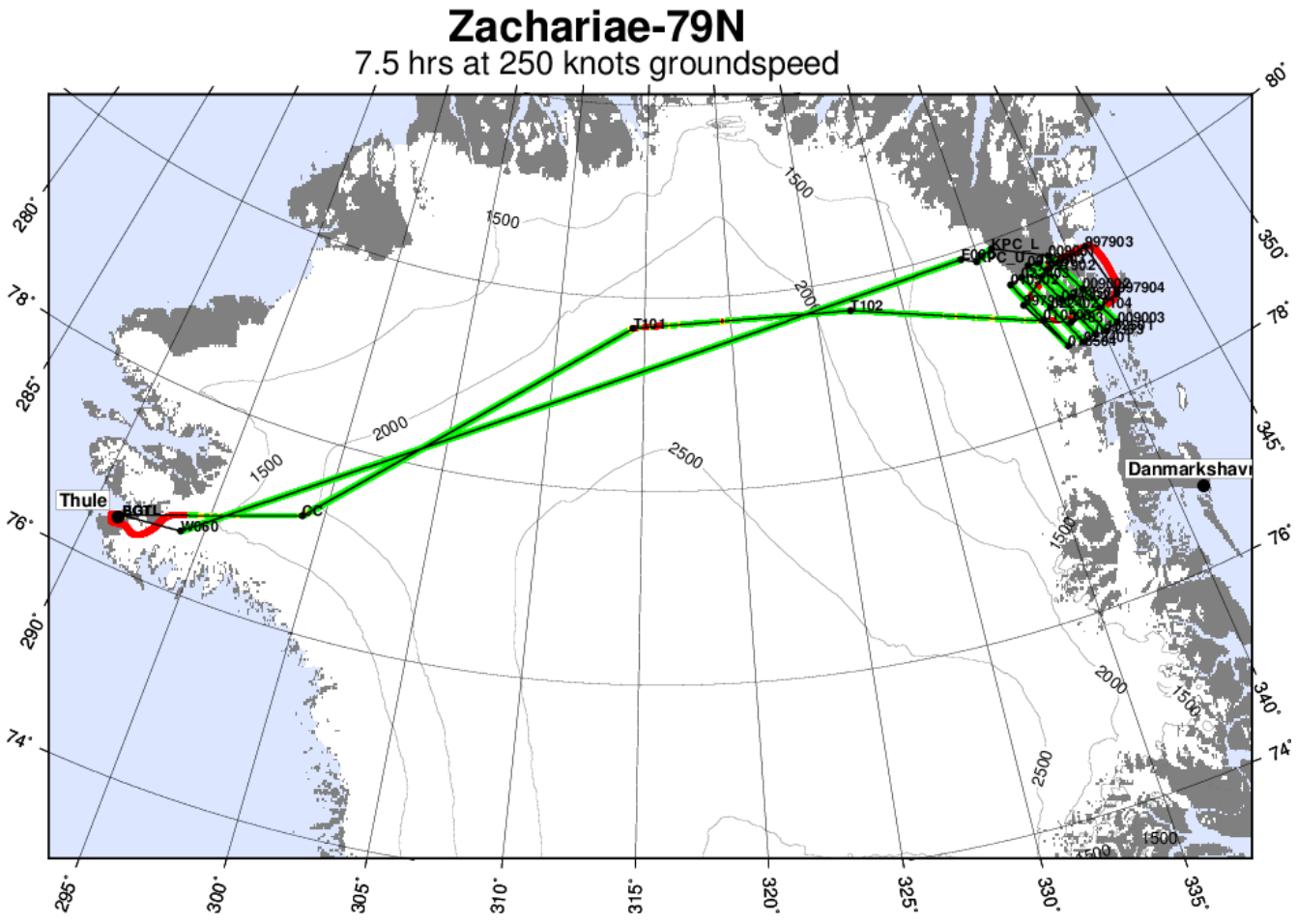
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: 0220,0309,0219
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Zachariae-79N / Thule

This mission reoccupies the centerlines of the Zacharaie and 79N glaciers, plus flies a grid of five ascending IceSat-1 tracks originally flown by OIB in 2012. It also overflies a pair of PROMICE sites immediately north of 79N Glacier. We transit to and from the northeast region along a historical ATM lines dating back to 1994, and along an as-yet unflown master grid line.

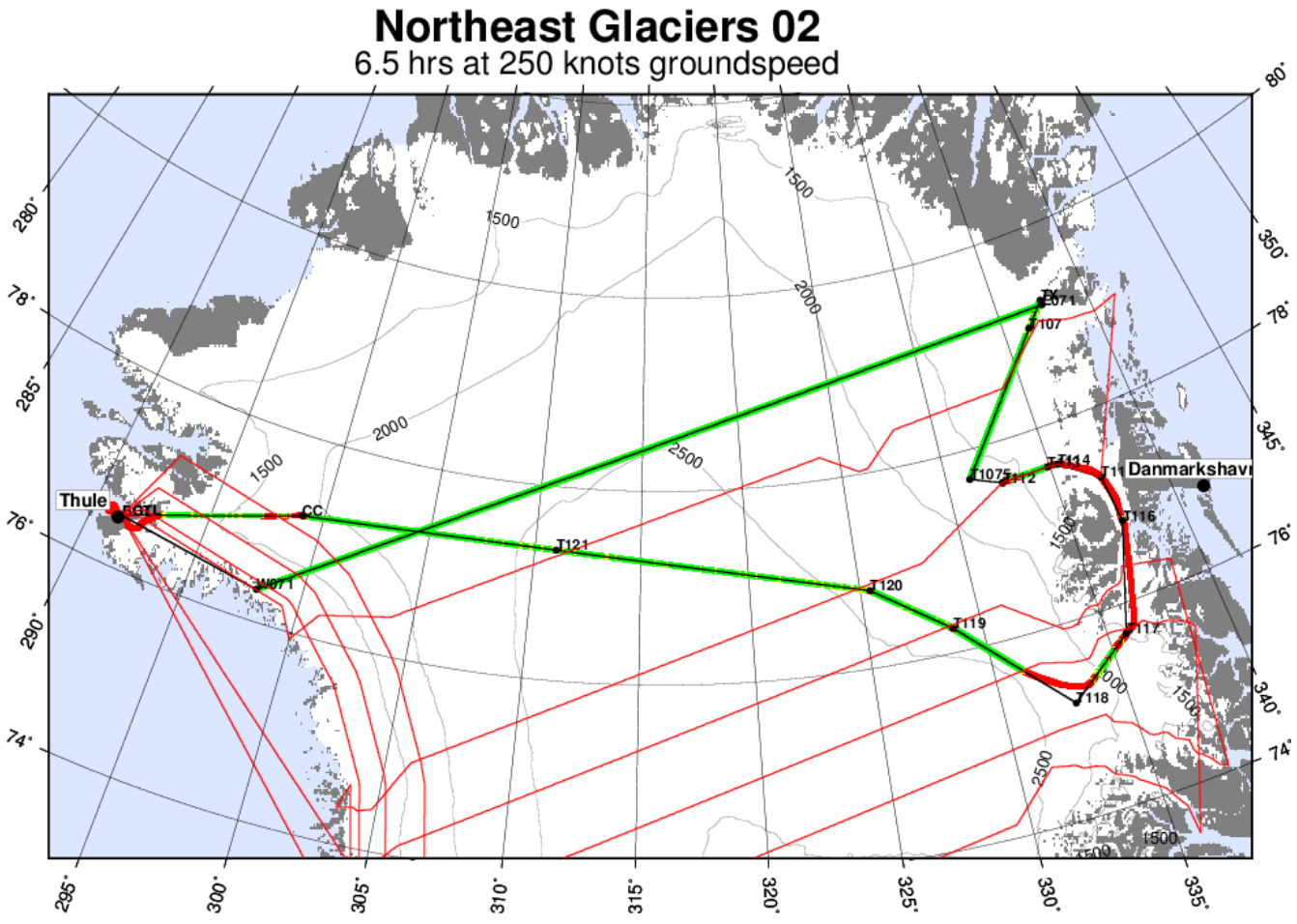
Flight Priority: baseline (annual repeat flight)
ICESat Track: 0090,0105,0224,0343,1325
Last Flown: IceSat grid lines in 2012, centerlines in 2014
Remaining Design Issues: none



Land Ice – Northeast Glaciers 02 / Thule

This mission reoccupies the centerlines of the Storstrommen and L Bistrup glaciers, as well as an extension of the Northeast Greenland Ice Stream from Zachariae and 79N Glaciers into the main ice sheet. We transit to and from the northeast region along a historical ATM line dating back to 1994, and along an as-yet unflown master grid line.

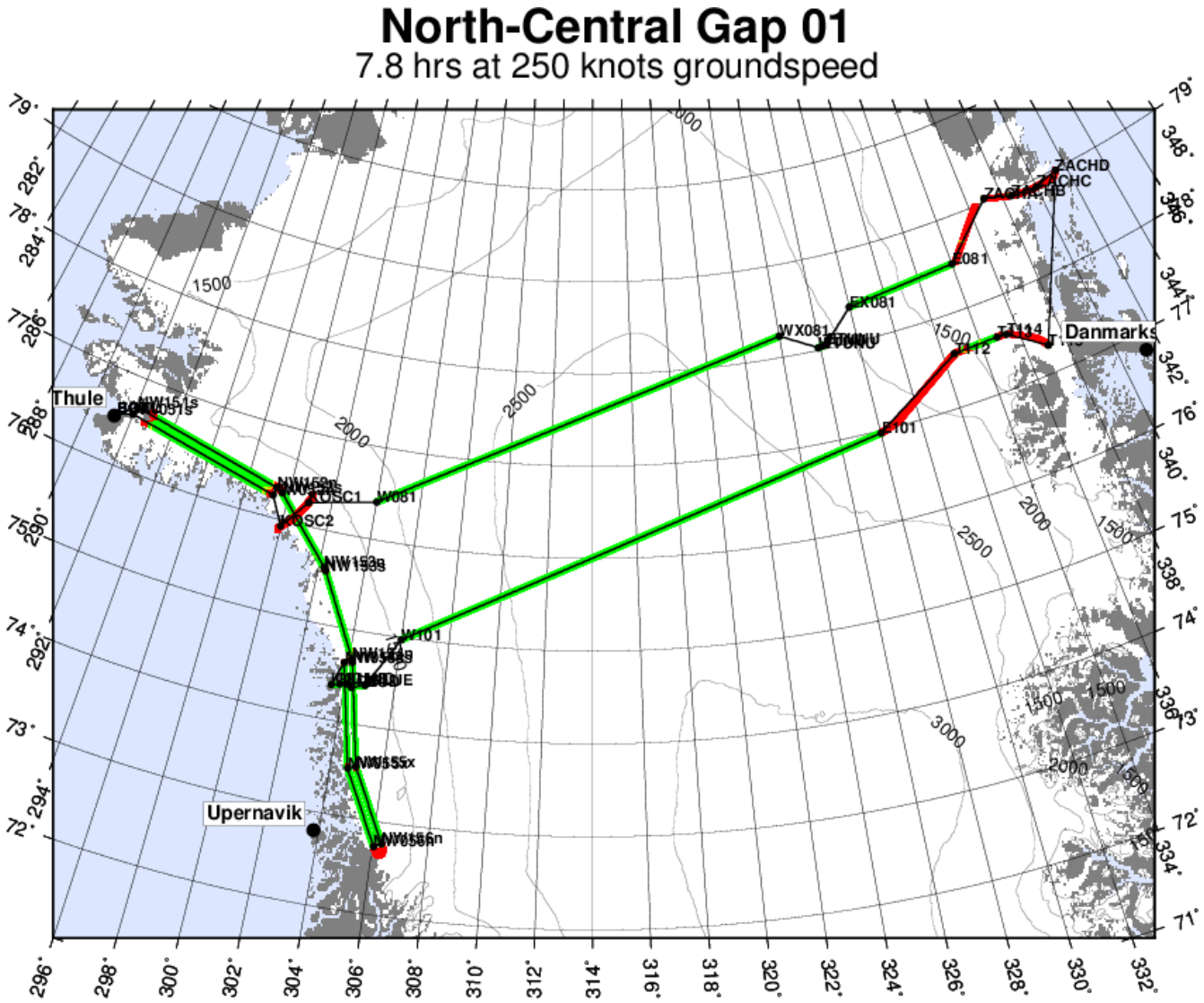
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2014
Remaining Design Issues: none



Land Ice – North Central Gap 01 / Thule

This mission, along with the North Central Gap 02 and 03 missions, are primarily designed to fill a gap in altimetry and radar coverage of the north-central portion of the ice sheet. In this flight, we also re-occupy centerlines of the Zacharaie, Storstrommen, Illulipsermia and Kong Oscar Glaciers, and we refly portions of the northwest coast-parallel grid flown from 2010-2012. We also overfly the TUNU core site.

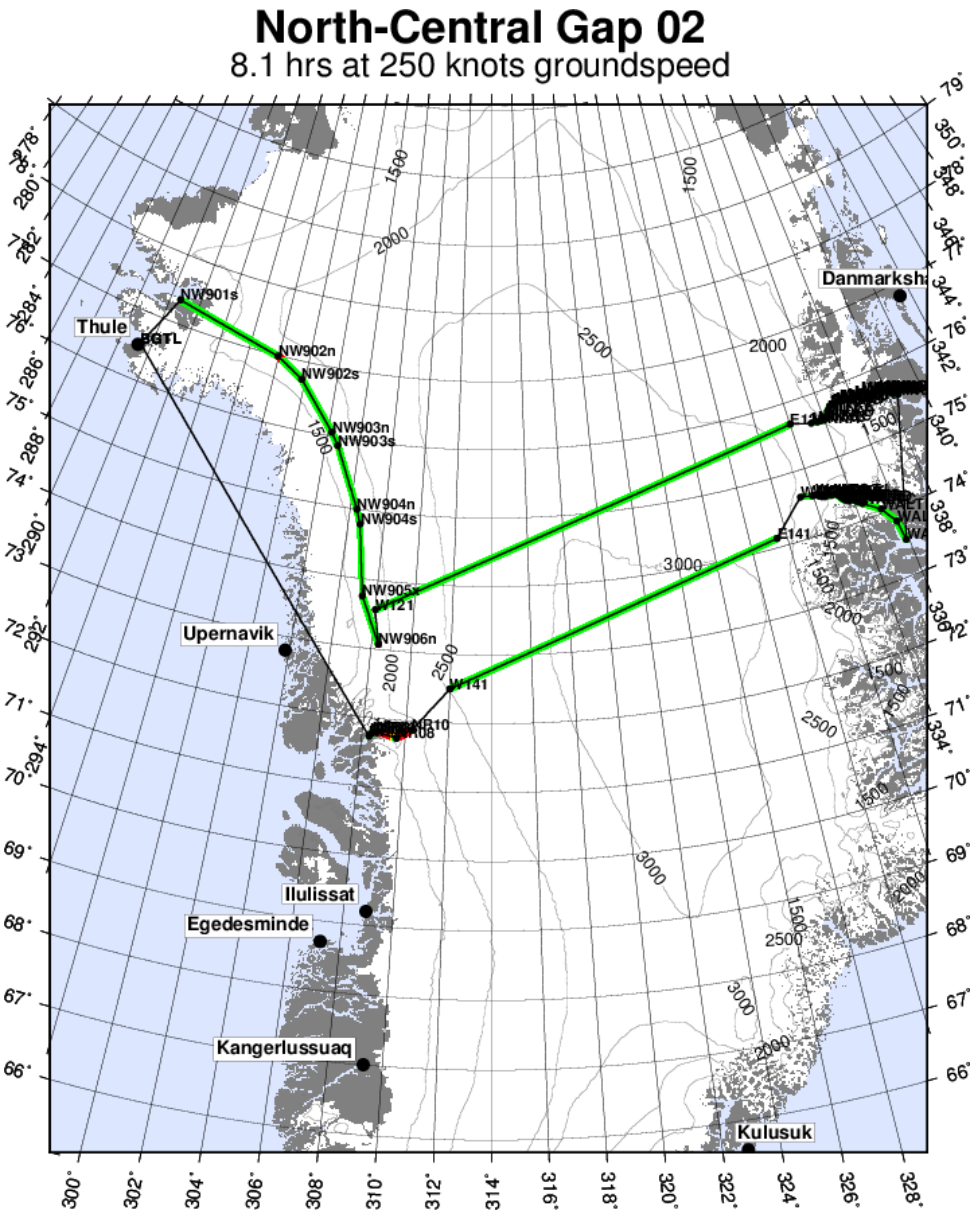
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2014
Remaining Design Issues: none



Land Ice – North Central Gap 02 / Thule

This mission, along with the North Central Gap 01 and 03 missions, are primarily designed to fill a gap in altimetry and radar coverage of the north-central portion of the ice sheet. In this flight, we also re-occupy centerlines of the Rink and Upernavik (central), glaciers, we establish new centerlines of the Mikkelsen and Waltershausen glaciers, and we refly portions of the northwest coast-parallel grid flown from 2010-2012. **This flight can be configured as a transit mission between Thule and Kangerlussuaq.**

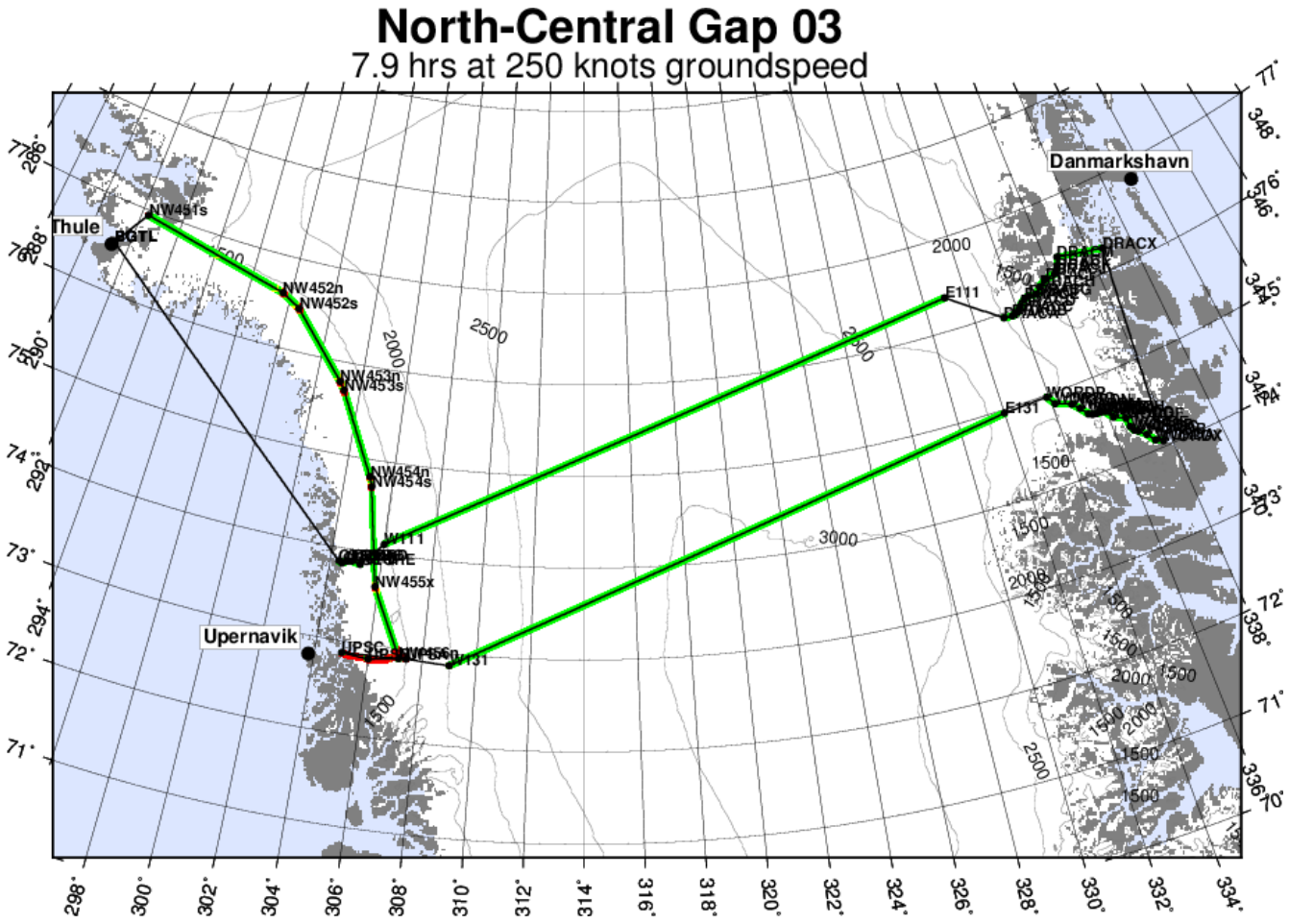
Flight Priority: medium(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: most in 2013
Remaining Design Issues: none



Land Ice – North Central Gap 03 / Thule

This mission, along with the North Central Gap 02 and 03 missions, are primarily designed to fill a gap in altimetry and radar coverage of the north-central portion of the ice sheet. In this flight, we also re-occupy centerlines of the Qeqertarsuap and Upernavik (south), glaciers, we fly centerlines of the Drachmann and Wordie glaciers, and we refly portions of the northwest coast-parallel grid flown from 2010-2012.

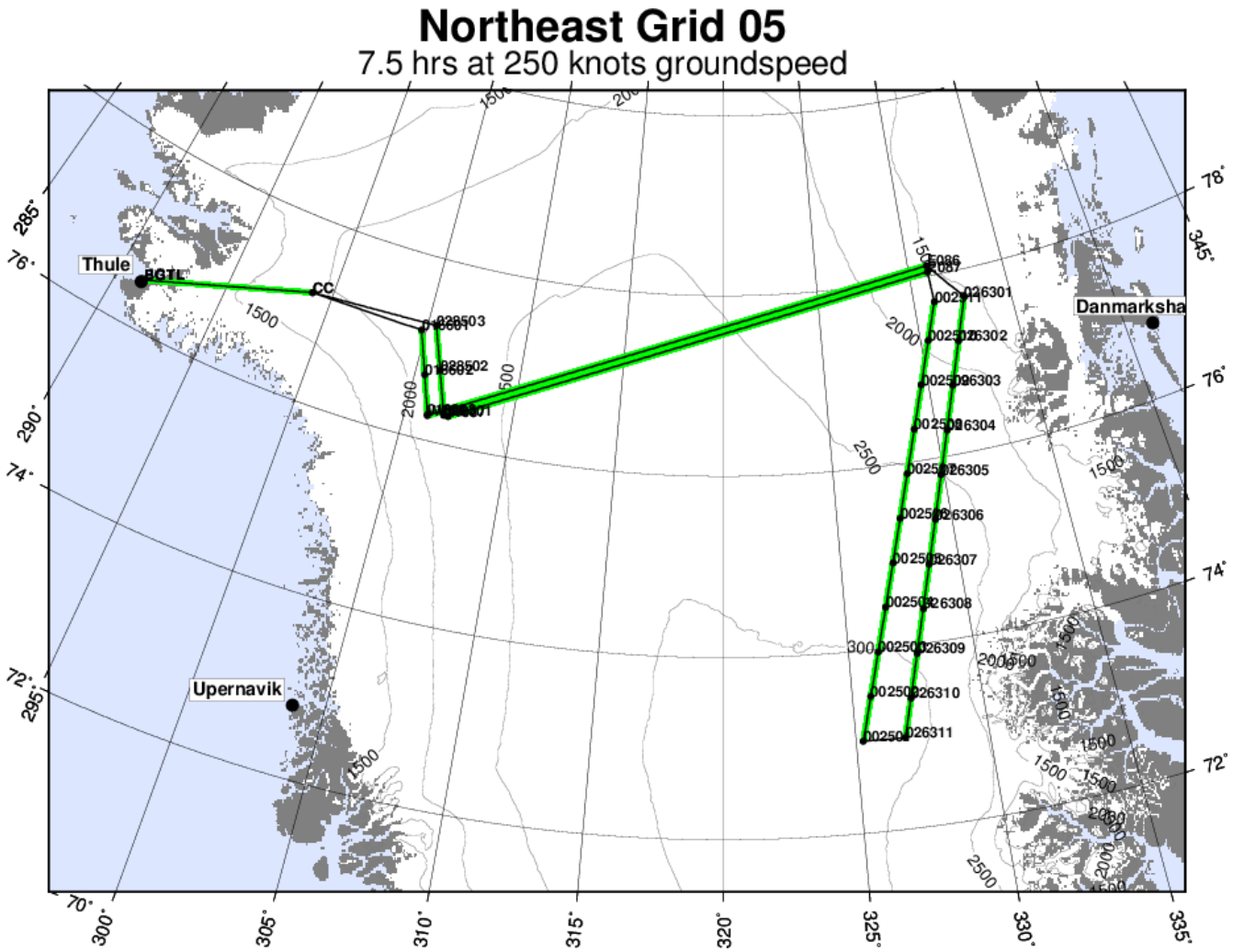
Flight Priority: medium(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2013
Remaining Design Issues: none



Land Ice – Northeast Grid 05 / Thule

This is a new mission, one of a suite of six flights intended to thoroughly sample the bedrock topography of northeast Greenland along a series of nearly coast-parallel ICESat lines. At the same time we obtain altimetry measurements along the ICESat tracks which will enable the calculation of dh/dt over a broad area and a significant time span. This particular mission complements the Northeast Grid 01/02/03/04 missions with the next two tracks in the inland direction. It transits to the area along short ICESat tracks in the west and new east-west master grid lines.

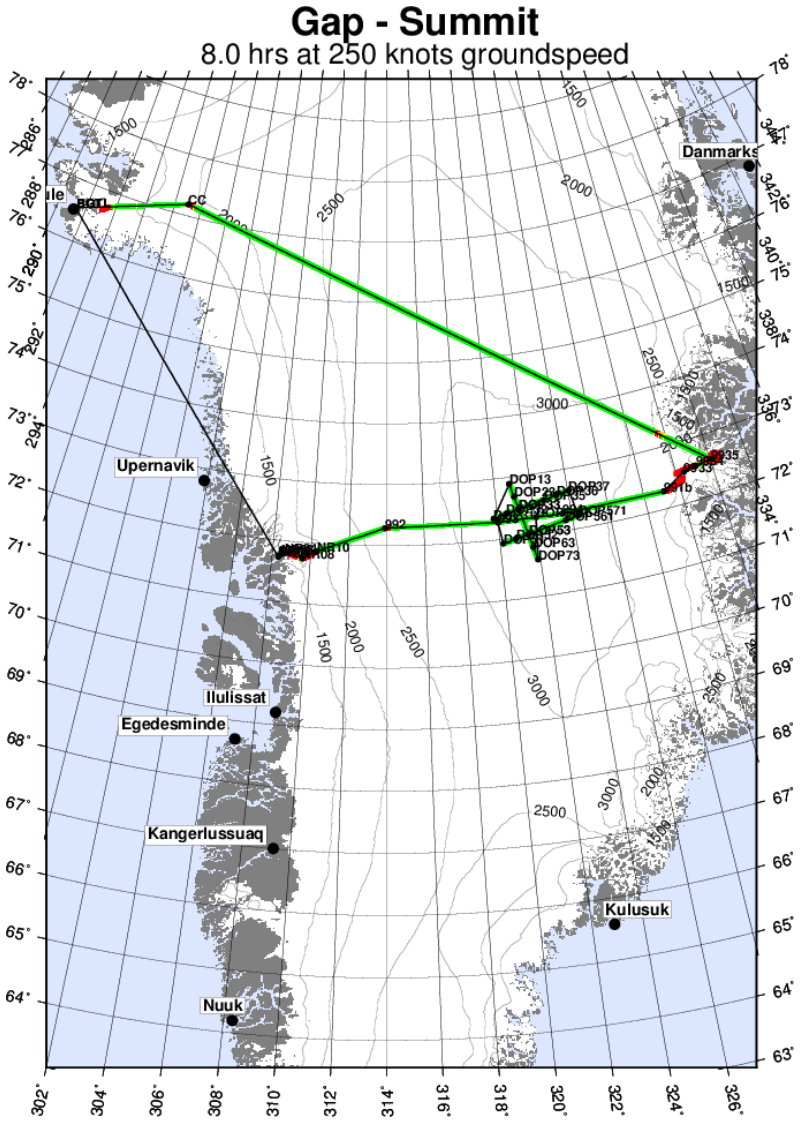
Flight Priority: low(?)
ICESat Track: 0166,0263,0025,0285
Last Flown: new flight
Remaining Design Issues: none



Land Ice – Gap-Summit / Thule

This mission was partially flown in 2012, and aborted due to a mechanical problem. Its primary purposes are twofold. First, we fly an east-west line all the way across the ice sheet from Rink Glacier in the west to Cecilia Nunatak in the east. This line also covers a gap in OIB coverage in central Greenland, and does so along a series of 1999 ATM lines to yield a lengthy dh/dt history. Second, we overfly a series of Doppler in-situ sites surveyed in 1987 near Summit, which again will yield an exceptionally long dh/dt history over these sites. We transit between Kangerlussuaq and Rink Glacier at high-altitude to save time, and we transit from Cecilia Nunatak to Thule along a 1999 ATM line. **This mission can be configured as a transit flight between Thule and Kangerlussuaq.**

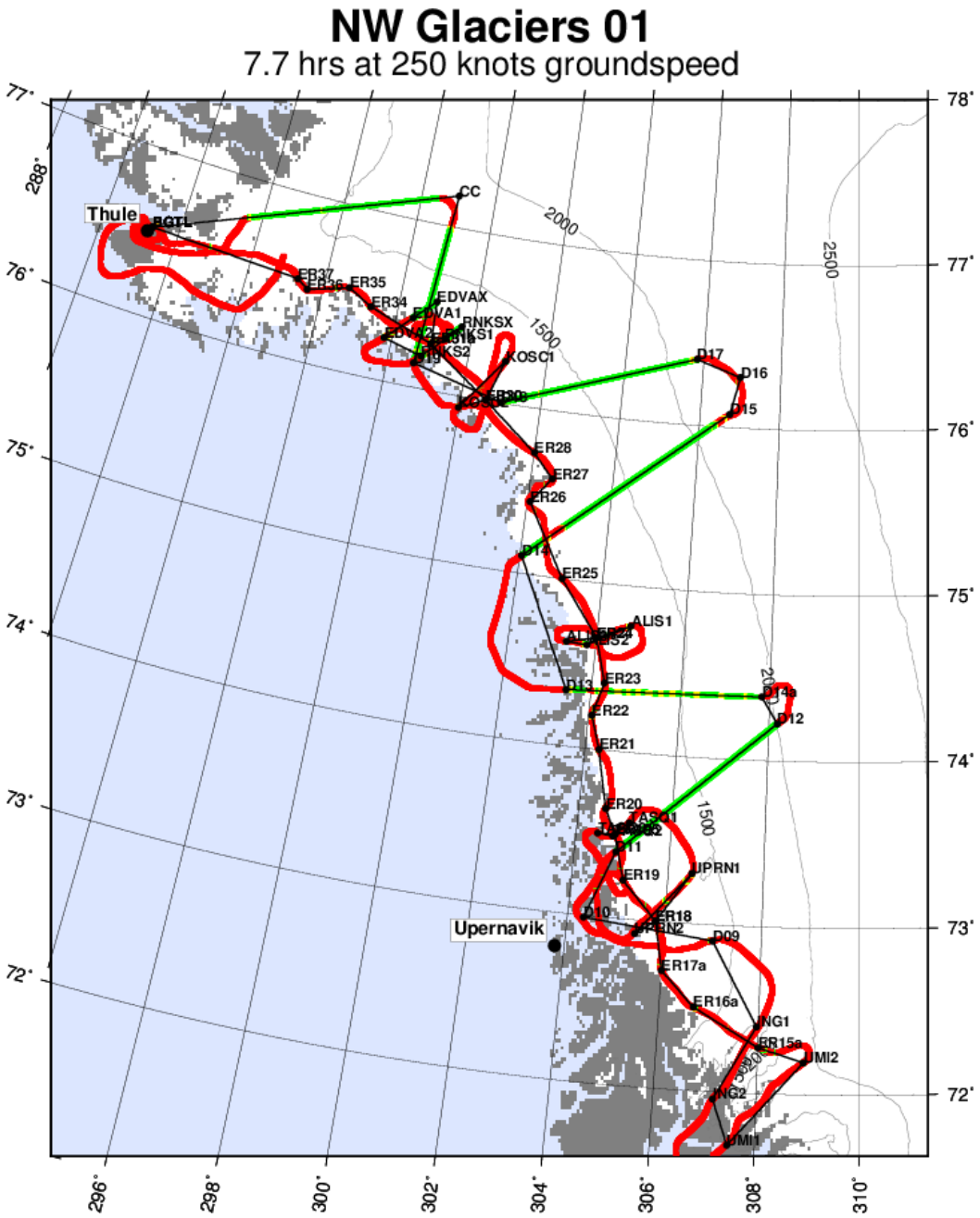
Flight Priority: low(?)
ICESat Track: none
Last Flown: 2012 (portions)
Remaining Design Issues: none



Land Ice – Northwest Glaciers 01 / Thule

This mission is a repeat of a 2009, 2010, 2011, 2012 and 2014 IceBridge mission. It focuses on the upper Baffin Bay coast, with targeted longitudinal surveys of 12 glaciers in the region and repeats of long-established ATM dh/dt lines which were not targeted at outlet glaciers, but instead were intended to track inland spread of coastal thinning.

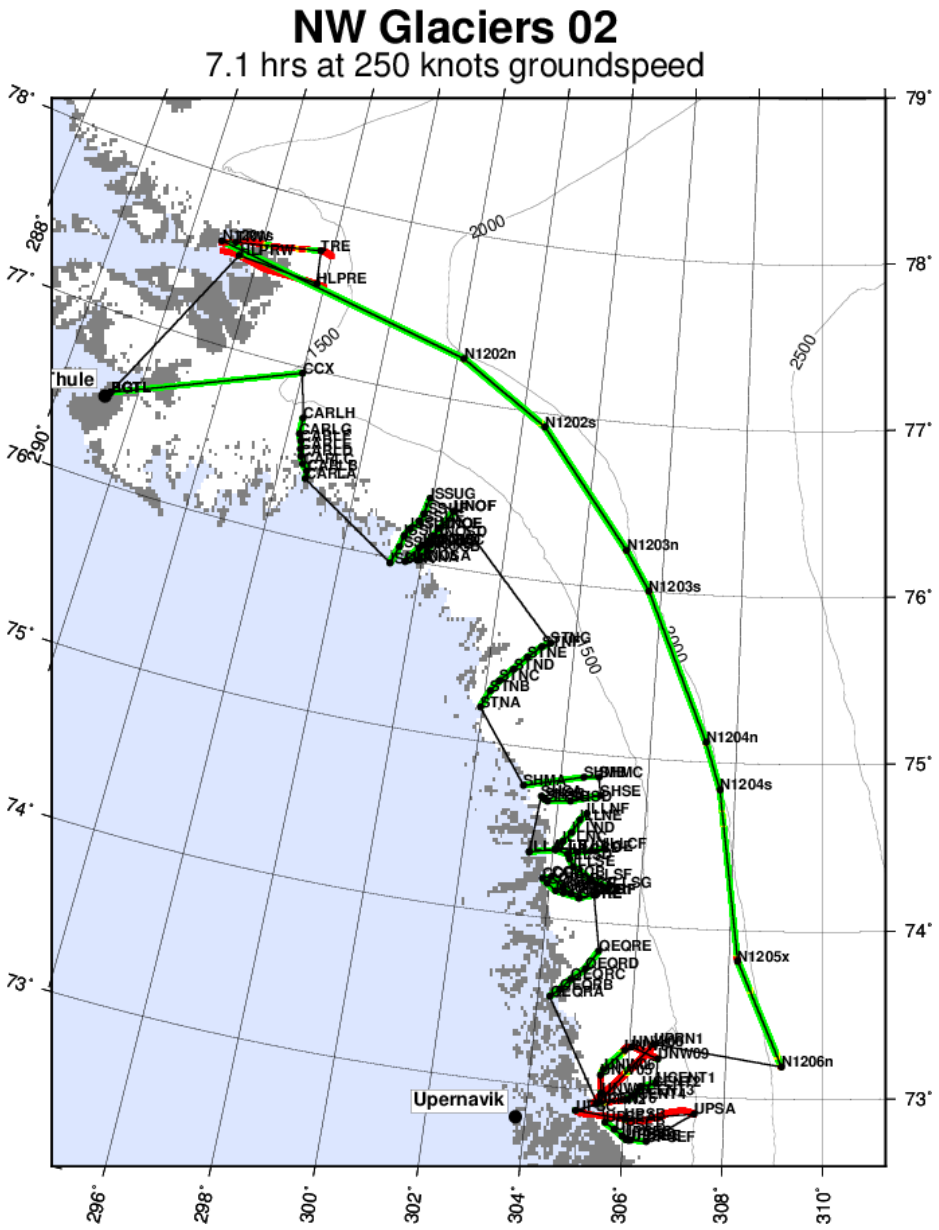
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Northwest Glaciers 02 / Thule

This mission focuses on the upper Baffin Bay coast, with targeted longitudinal surveys of the most significant glaciers in the region not flown prior to this flight's first implementation in 2014. We also resurvey the centerlines of the Tracy and Heilprin glaciers, and we refly a previously-flown inland line from the “northwest coastal” suite of missions.

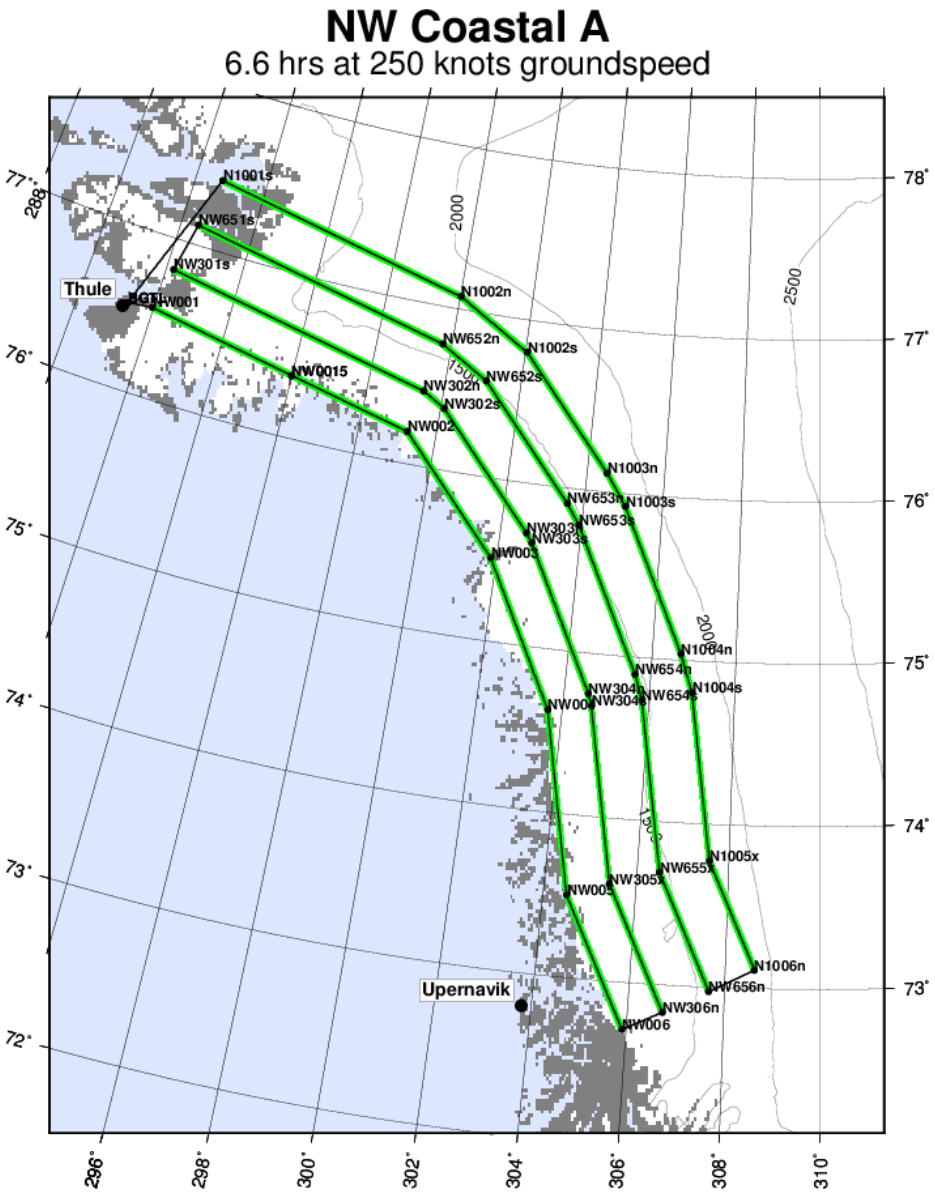
Flight Priority: low(?) (multi-year repeat mission)
ICESat Track: none
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Northwest Coastal A / Thule

This is a new mission, created from the 2010-2012 “Northwest Coastal” suite of missions by sampling individual coast-parallel lines from those flights to form a grid spaced at 30-35 km from the coast to near the 2000m contour line. This is one of three missions designed in this way, which together form a 10 km grid in the area. The others are Northwest Coastal B and C.

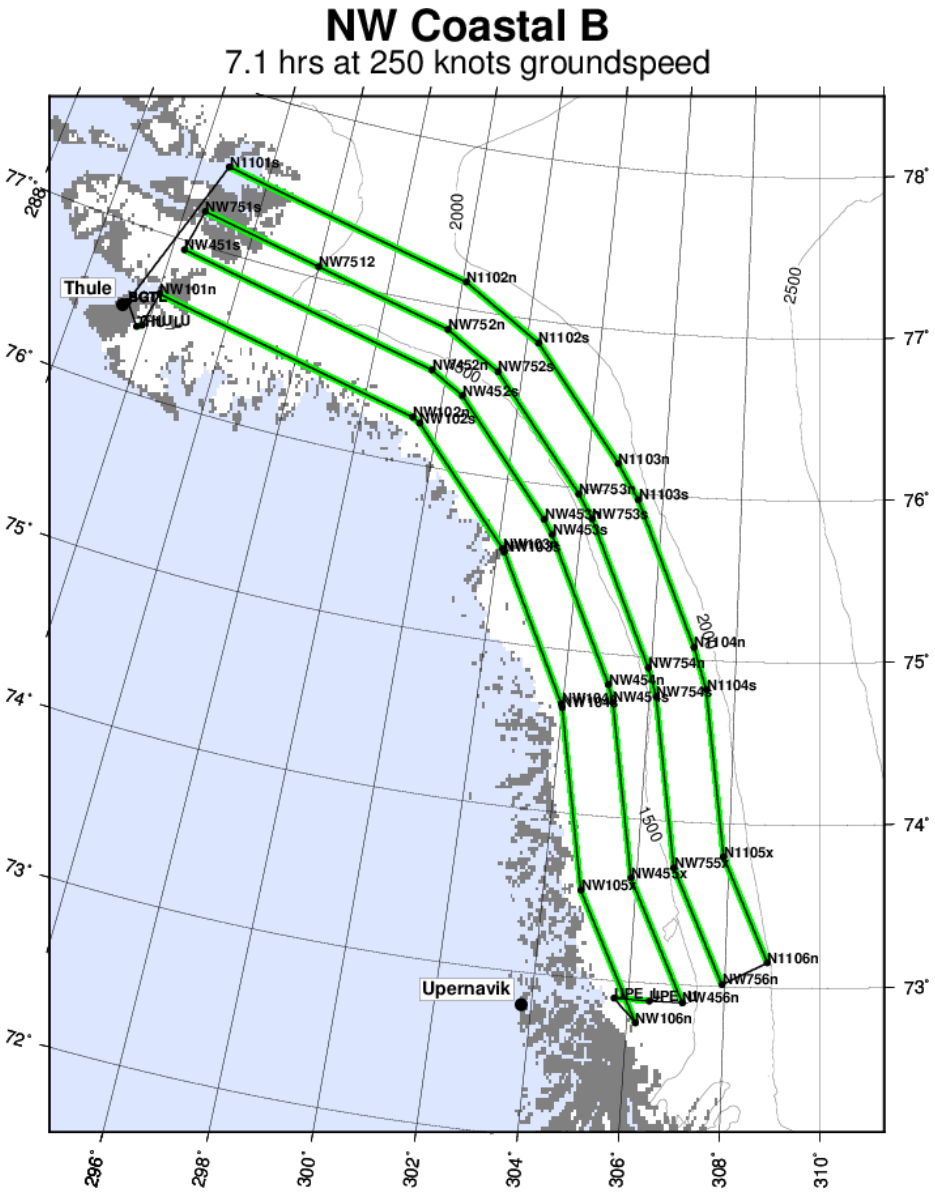
Flight Priority: high(?) (multi-year repeat mission)
ICESat Track: none
Last Flown: portions from 2010-2012
Remaining Design Issues: none



Land Ice – Northwest Coastal B / Thule

This mission was created from the 2010-2012 "Northwest Coastal" suite of missions by sampling individual coast-parallel lines from those flights to form a grid spaced at 30-35 km from the coast to near the 2000m contour line. This is one of three missions designed in this way, which together form a 10 km grid in the area. The others are Northwest Coastal A and C. This particular mission also overflies four PROMICE sites, two near Thule and two near Upernavik.

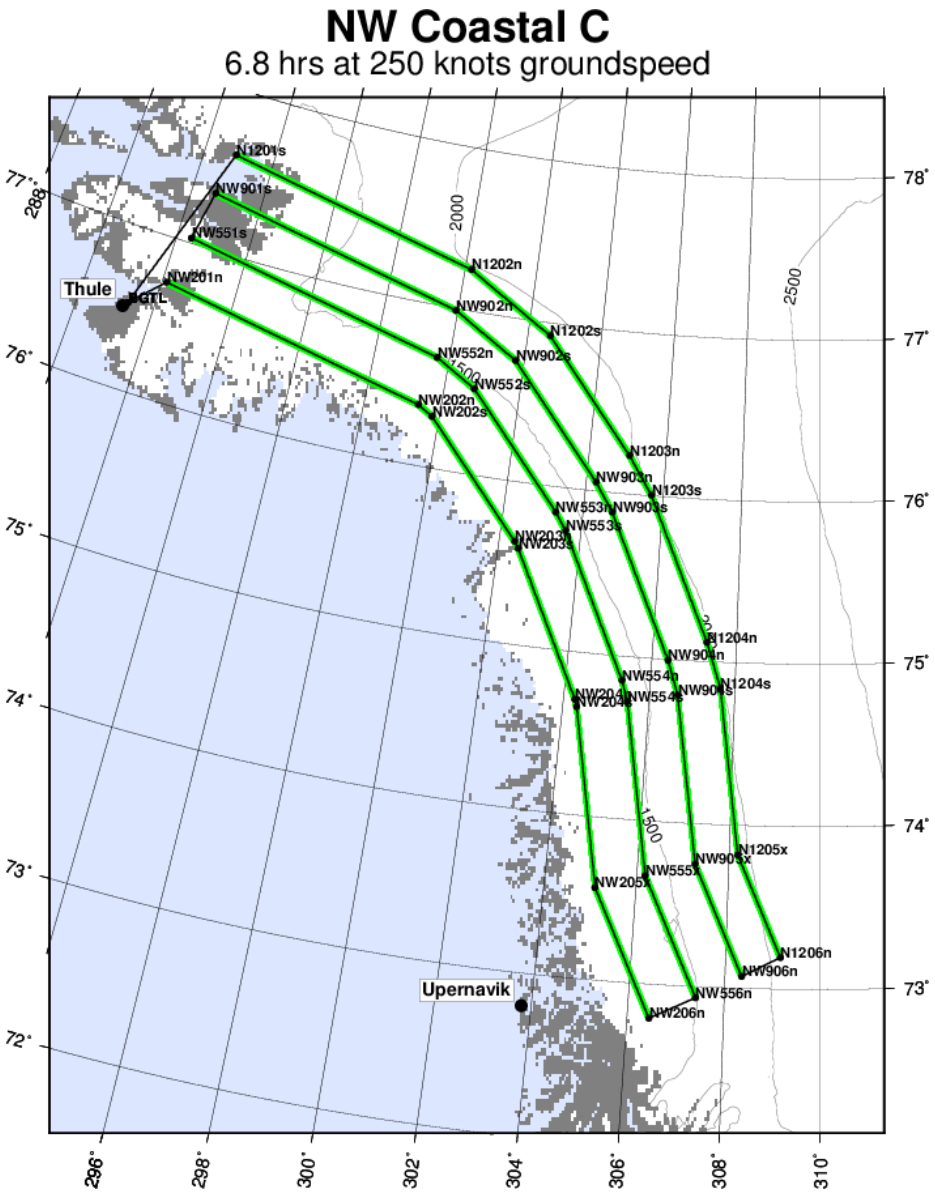
Flight Priority: low(?) (multi-year repeat mission)
ICESat Track: none
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Northwest Coastal C / Thule

This mission was created from the 2010-2012 "Northwest Coastal" suite of missions by sampling individual coast-parallel lines from those flights to form a grid spaced at 30-35 km from the coast to near the 2000m contour line. This is one of three missions designed in this way, which together form a 10 km grid in the area. The others are Northwest Coastal A and B.

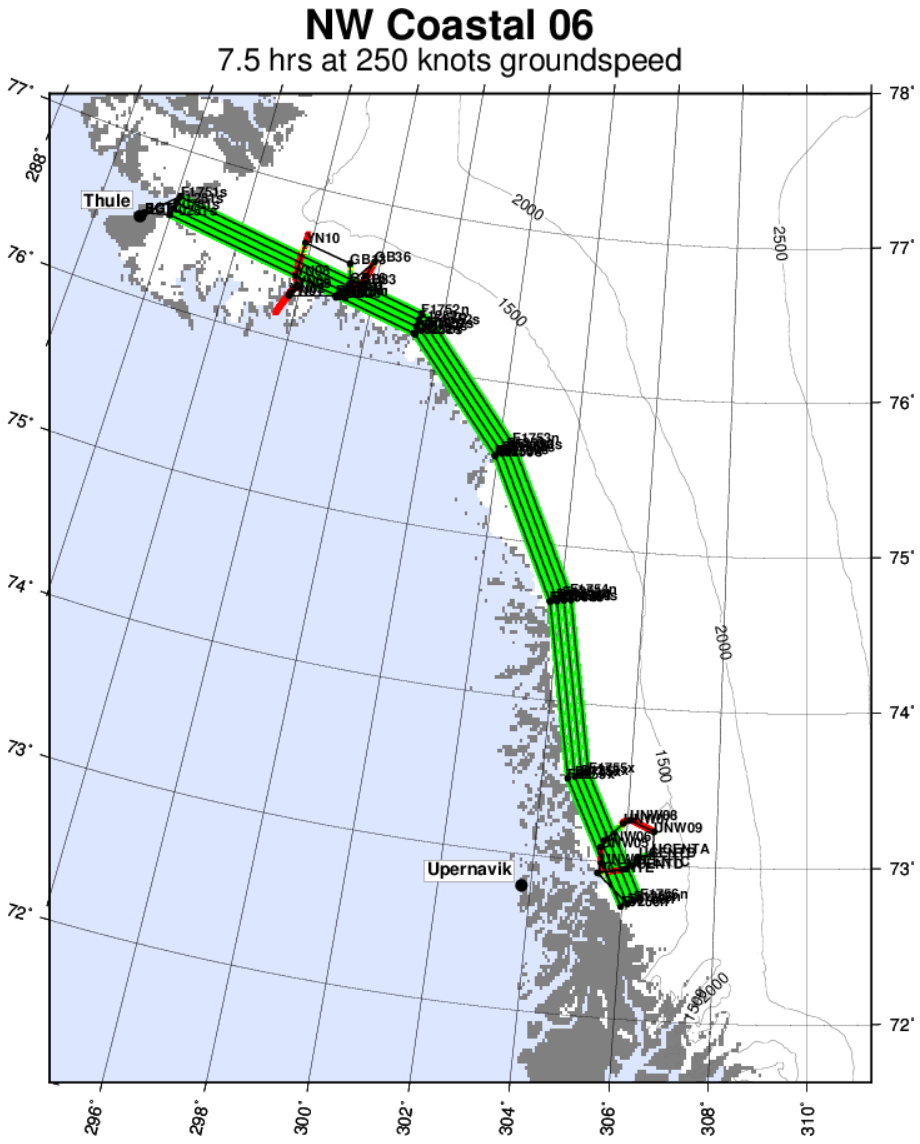
Flight Priority: low(?) (multi-year repeat mission)
ICESat Track: none
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Northwest Coastal 06 / Thule

This is a new mission which interlaces the 2010-2011 Northwest Coastal coast-parallel grid, which had a spacing of 5 km, to 2.5 km. This flight also reoccupies the centerlines of the Upernavik Northwest and Yngvar Nielsen glaciers, and establishes new centerlines along the Upernavik middle ice stream, and both branches of the wishbone-shaped Gades Brae glacier. The companion Northwest Coastal 07 mission performs the same interlace strategy but farther inland.

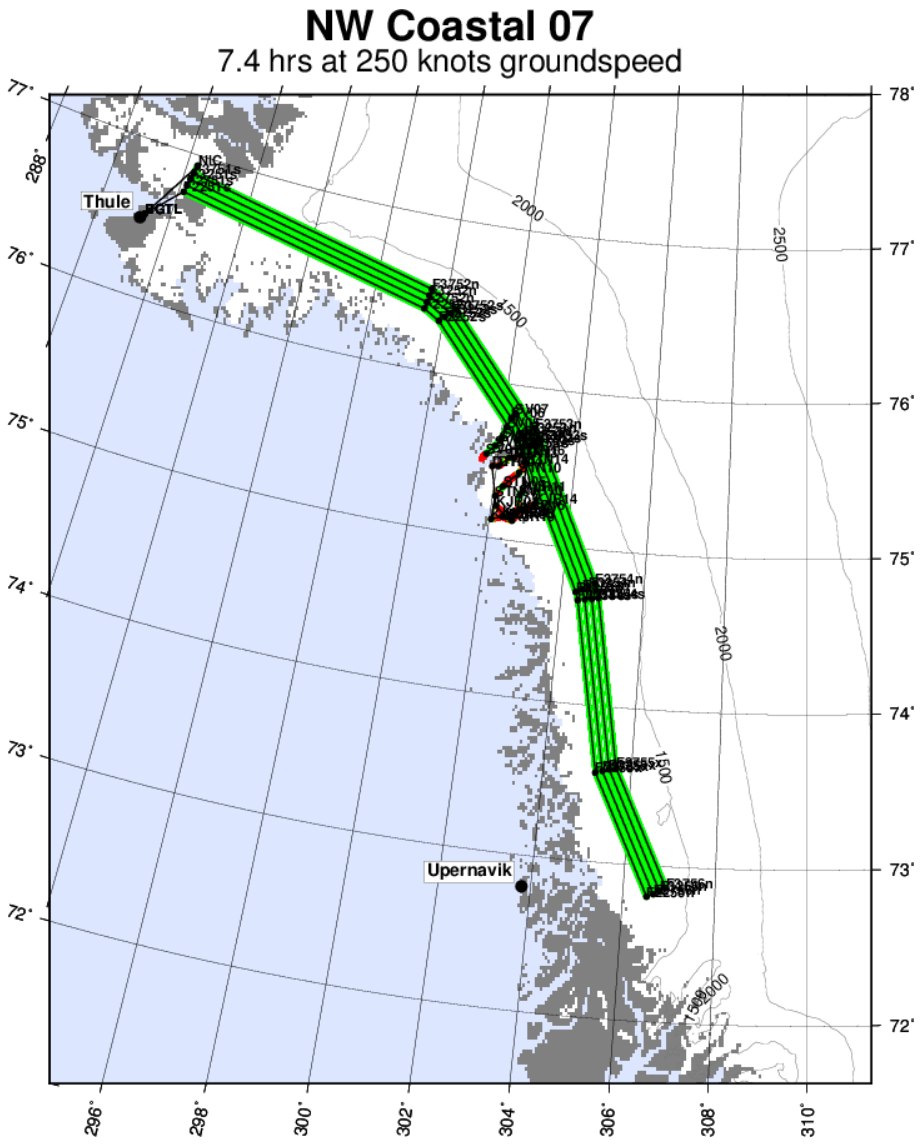
Flight Priority: medium(?)
ICESat Track: none
Last Flown: new flight
Remaining Design Issues: none



Land Ice – Northwest Coastal 07 / Thule

This is a new mission which interlaces the 2010-2011 Northwest Coastal coast-parallel grid, which had a spacing of 5 km, to 2.5 km. The companion Northwest Coastal 06 mission does the same but farther to seaward. We also refly the centerline of the Sverdrup Glacier, and fly new centerlines on Dietrichson, Steenstrups, and a pair of centerlines on Kjaer Glacier.

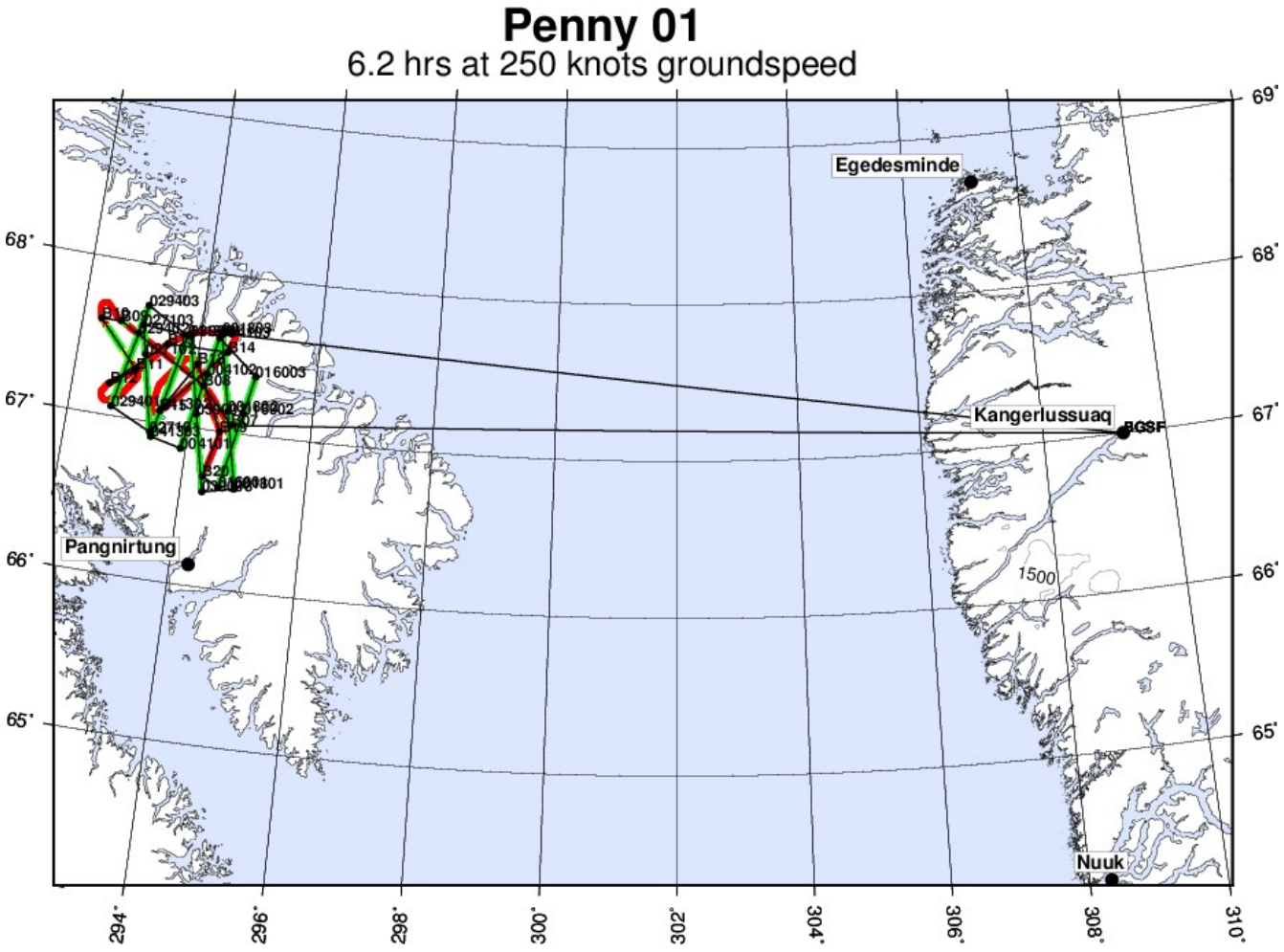
Flight Priority: low(?)
ICESat Track: none
Last Flown: new flight
Remaining Design Issues: none



Land Ice – Penny 01 / Kangerlussuaq

This mission repeats survey lines over the Penny Ice Cap previously surveyed by the ATM/KU teams in 1995, 2000, and 2005, and adds several new lines along ICESat ground tracks over the ice cap. **This mission can be configured as a transit flight between Thule and Kangerlussuaq.**

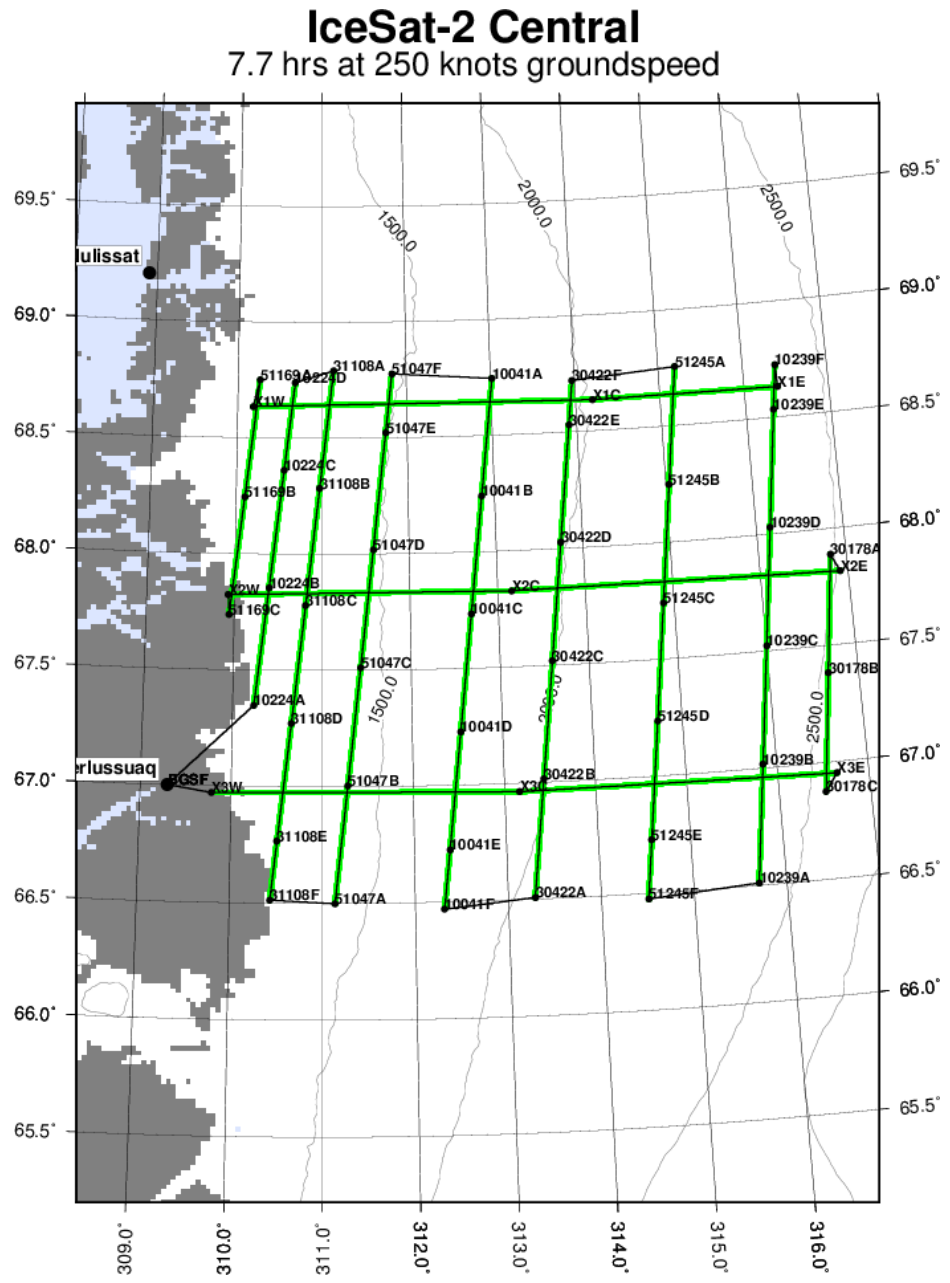
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: 0160/0041/0413/0294/0271/0390/0018
Last Flown: 2014
Remaining Design Issues: none



Land Ice – IceSat-2 Central / Kangerlussuaq

This mission was designed to overfly planned IceSat-2 ground tracks over a wide range of ice regimes near Kangerlussuaq. We center some of the flightlines on each of three beam pairs (left, nadir and right) in turn, sampling three of each beam pair during this mission. The east-west crossing lines are designed to capture as many ascending/descending crossovers as possible.

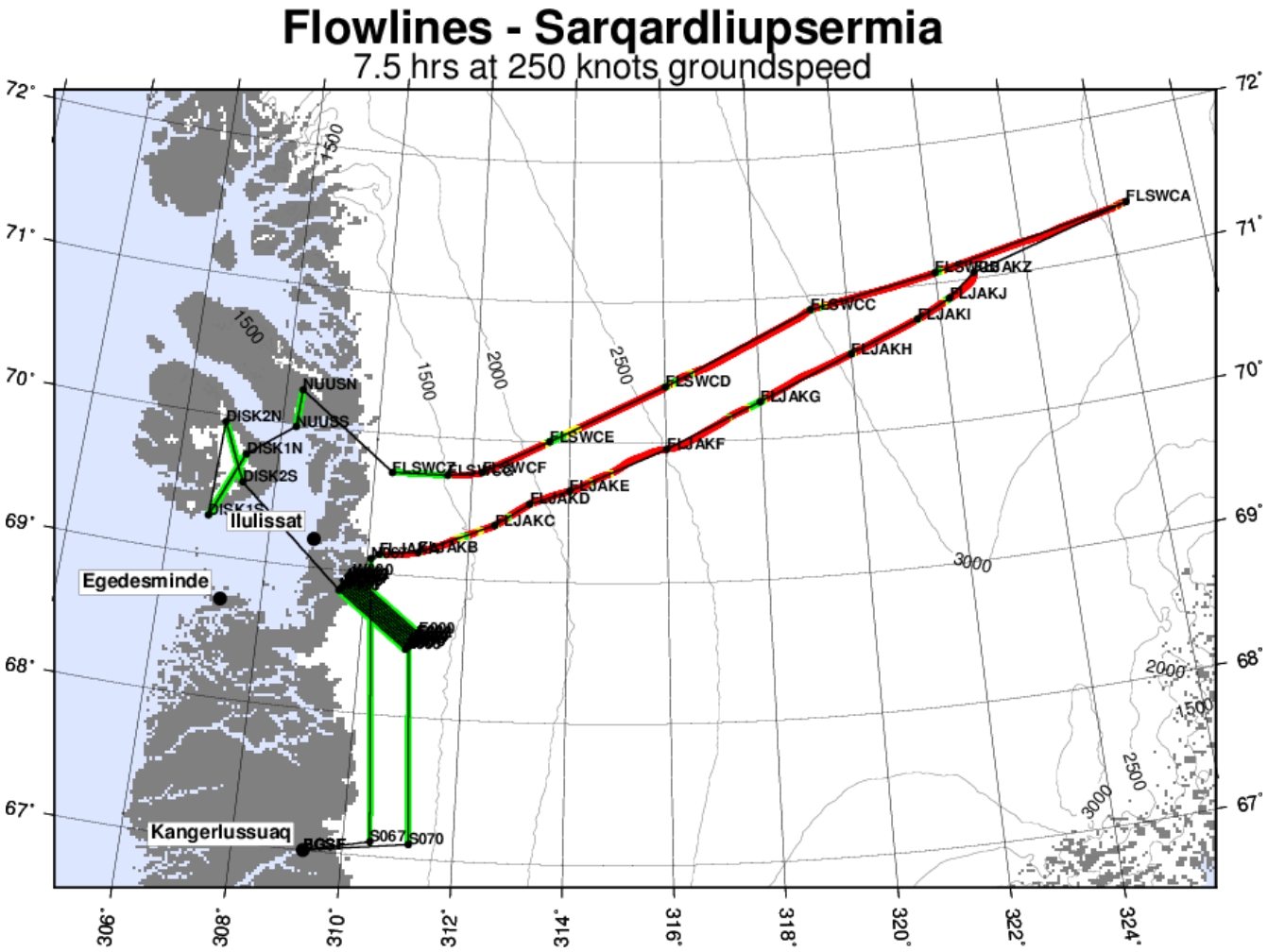
Flight Priority: baseline (annual repeat flight)
IceSat-2 Track: 1169,1022,1047,0041,0422,1245,0239,0178
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Flowlines-Sarqardliupsermia / Kangerlussuaq

This new flight has several objectives. First, we fly flowlines of the Jakobshavn Glacier and another through Swiss Camp all the way to the ice divide. We also fly a tomography grid over Sarqardliupsermia glacier consisting of nine lines spaced at 2 km. Finally, we fly lines over small ice caps on Disko Island and the Nussuaq Peninsula first flown in 2012. The MCoRDS radar should be configured in tomographic mode (beamwidth +/- 35 deg, chirp length 10 us, one waveform with 10 us chirp) for the Sarqardliupsermia grid, and in normal profiling mode for the rest of this flight. Flight elevation for the tomography portion should be 800 m, or 2600 ft AGL.

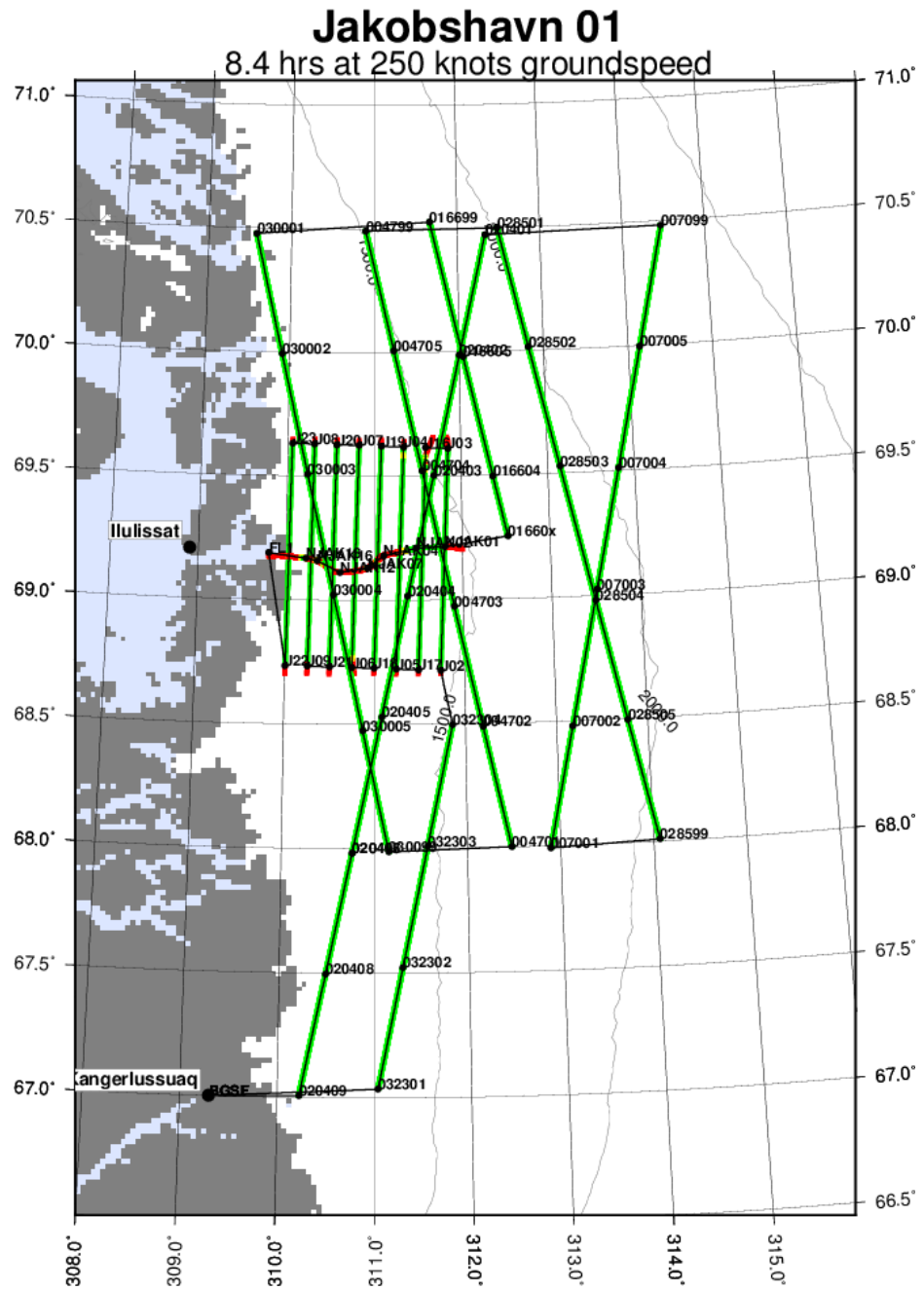
Flight Priority: low(?)
ICESat Track: none
Last Flown: small ice caps in 2012, the rest are new lines
Remaining Design Issues: none



Land Ice – Jakobshavn 01 / Kangerlussuaq

This is a repeat of 2009, 2010, 2011, 2012, 2013 and 2014 IceBridge missions. Its purpose is to re-survey the highest-priority lines of the historical ATM 10-km Jakobshavn grid, the main flowline of Jakobshavn. It also extends that grid with a broader array of ICESat ground tracks over the larger Jakobshavn basin.

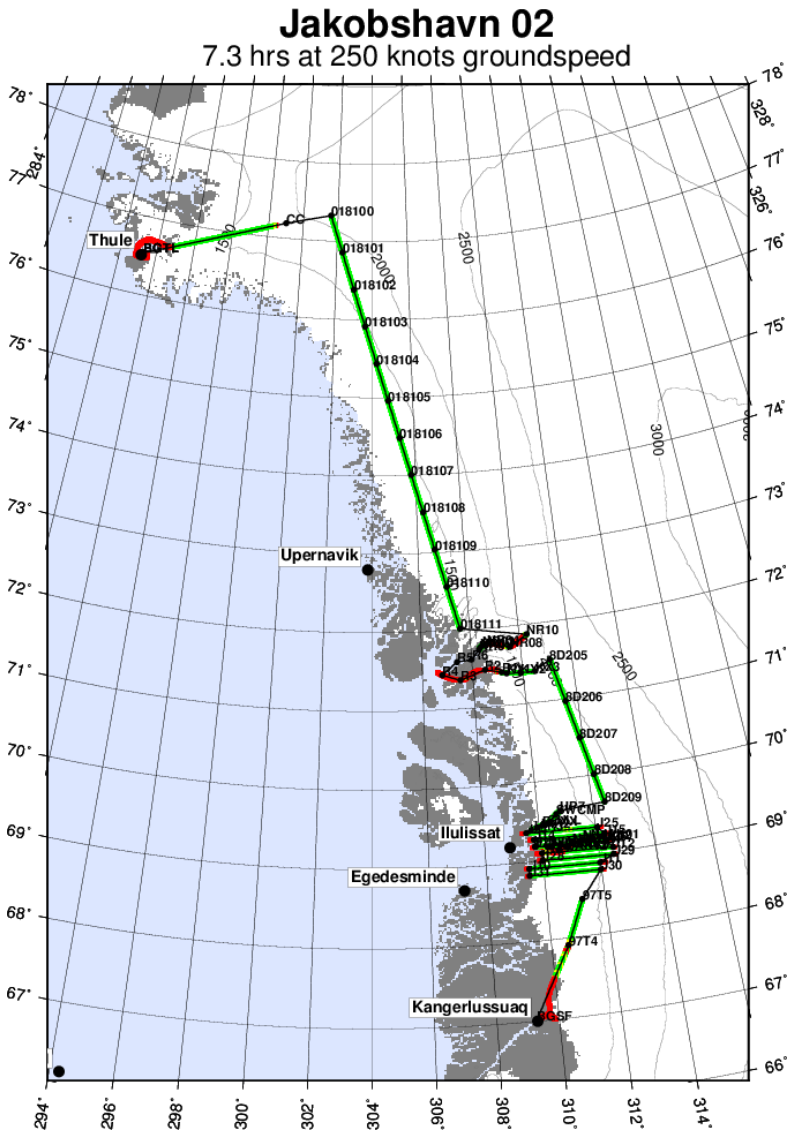
Flight Priority: baseline (annual repeat flight)
ICESat Track: 0323,0300,0047,0285,0070,0204
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Jakobshavn 02 / Kangerlussuaq

This mission is a repeat of similar 2009, 2010, 2011, 2012, 2013 and 2014 OIB flights. The primary science objectives are to (a) complete the basic Jakobshavn grid, specifically the east-west lines, and (b) repeat longitudinal surveys of the Rink and Kangerdlugssup Glaciers. We also occupy a line connecting Swiss Camp and a pair of Eric Lutz-requested points nearby. Finally we fly the main Jakobshavn centerline twice, once at normal speed and altitude, and again as low and slow as possible, for MCoRDS radar assessment. **This mission can be configured as a transit flight between Thule and Kangerlussuaq.**

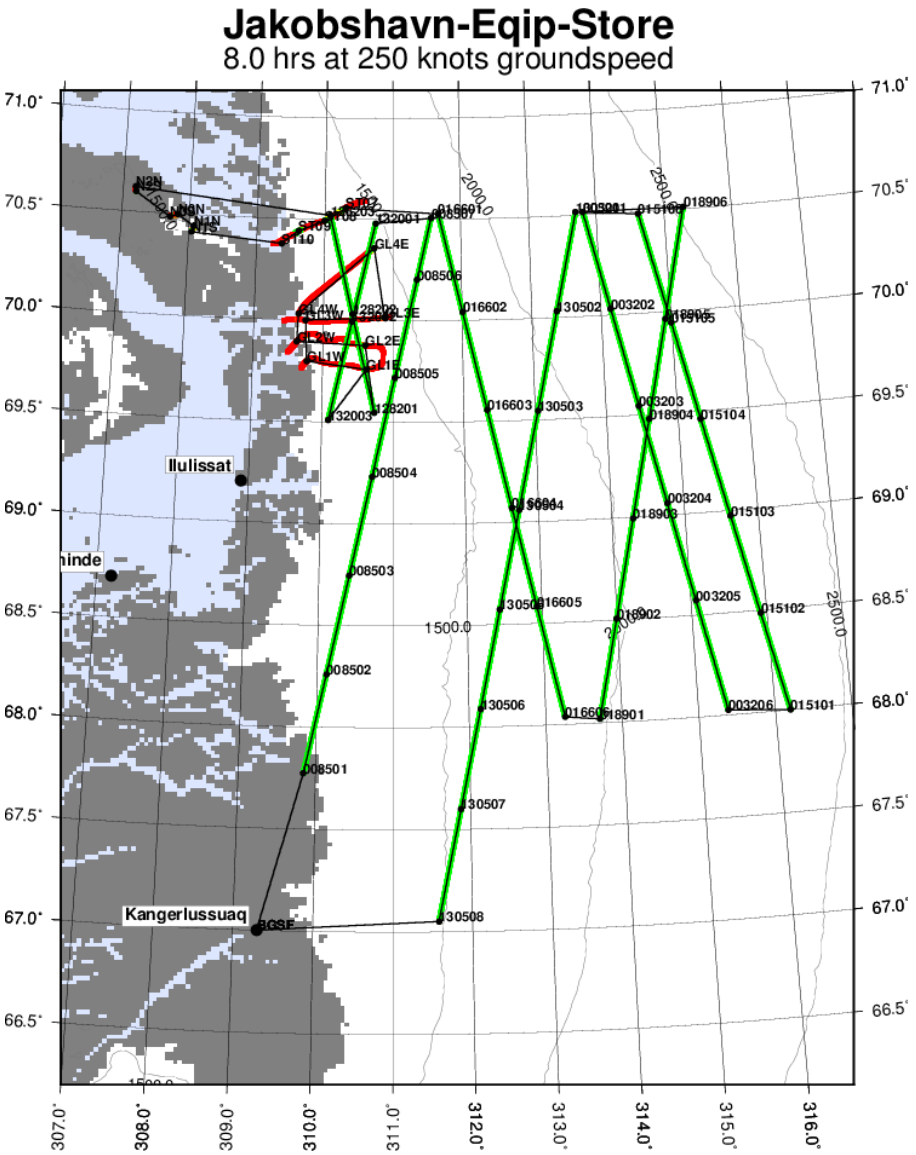
Flight Priority: baseline (annual repeat flight)
ICESat Track: 0181
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Jakobshavn-Eqip-Store / Kangerlussuaq

This is a modified version of the 2011 Jakobshavn-Lake mission, whose main purpose it to extend the ICESat grid begun with Jakobshavn 01 farther upstream. We also densify the ICESat grid over the Eqip Sermia catchment area north of Jakobshavn, and we refly the centerlines of Eqip Sermia, Kangilerngata Sermia, Sermeq Kujalleq and Store Glaciers. Finally we flew three new lines over small ice caps on the Nussuaq Peninsula.

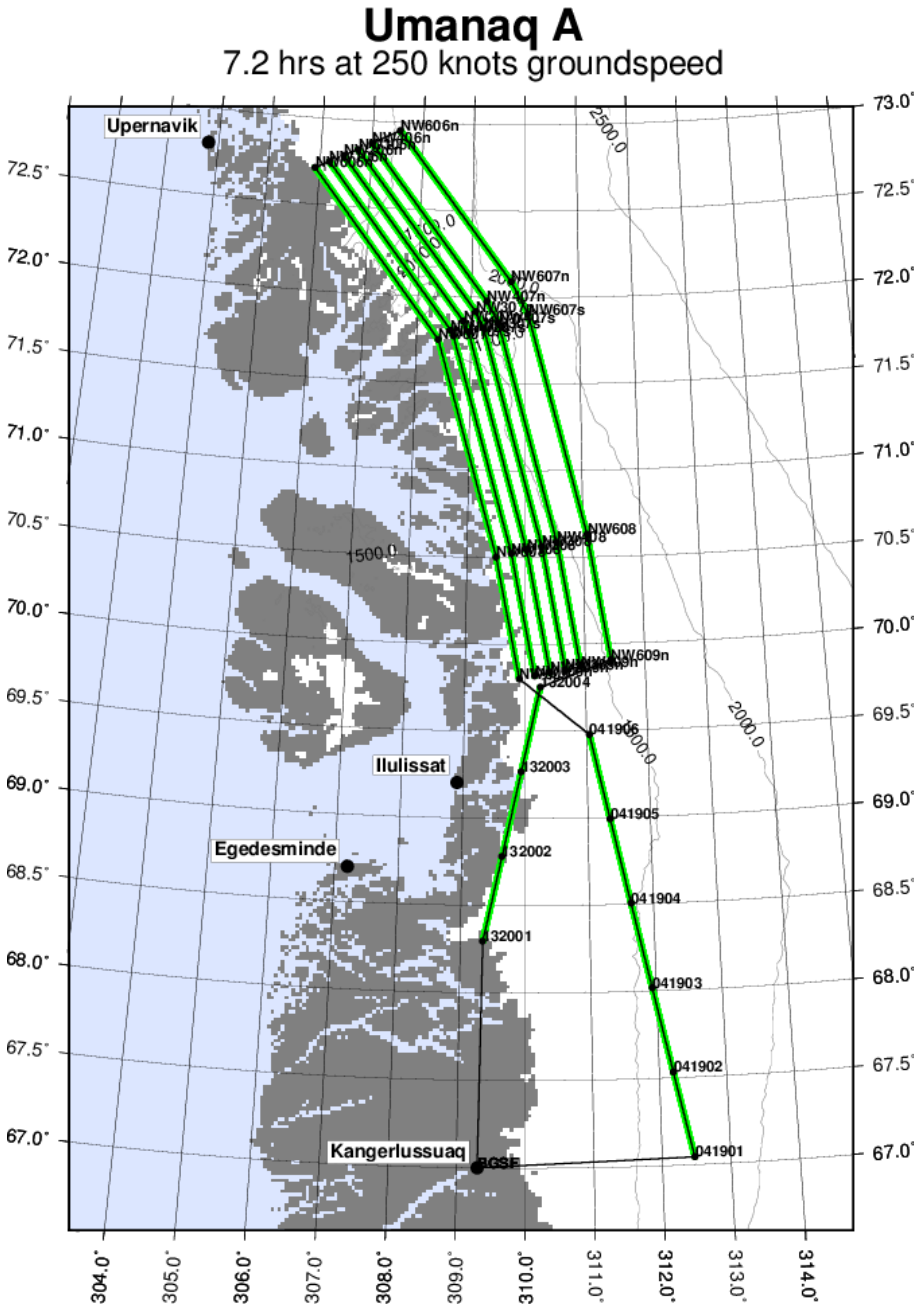
Flight Priority: baseline (annual repeat flight)
ICESat Track: 0085,1320,1282,0166,0189,0032,0151,1305
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Umanaq A / Kangerlussuaq

This new mission was designed (along with Umanaq B) to refly the 2012 Umanaq coast-parallel grid with a pair of interlaced missions. This mission by itself reoccupies a grid spaced at 10 km near the coast, widening to 20 km upstream. The two flights together establish a grid at half this spacing.

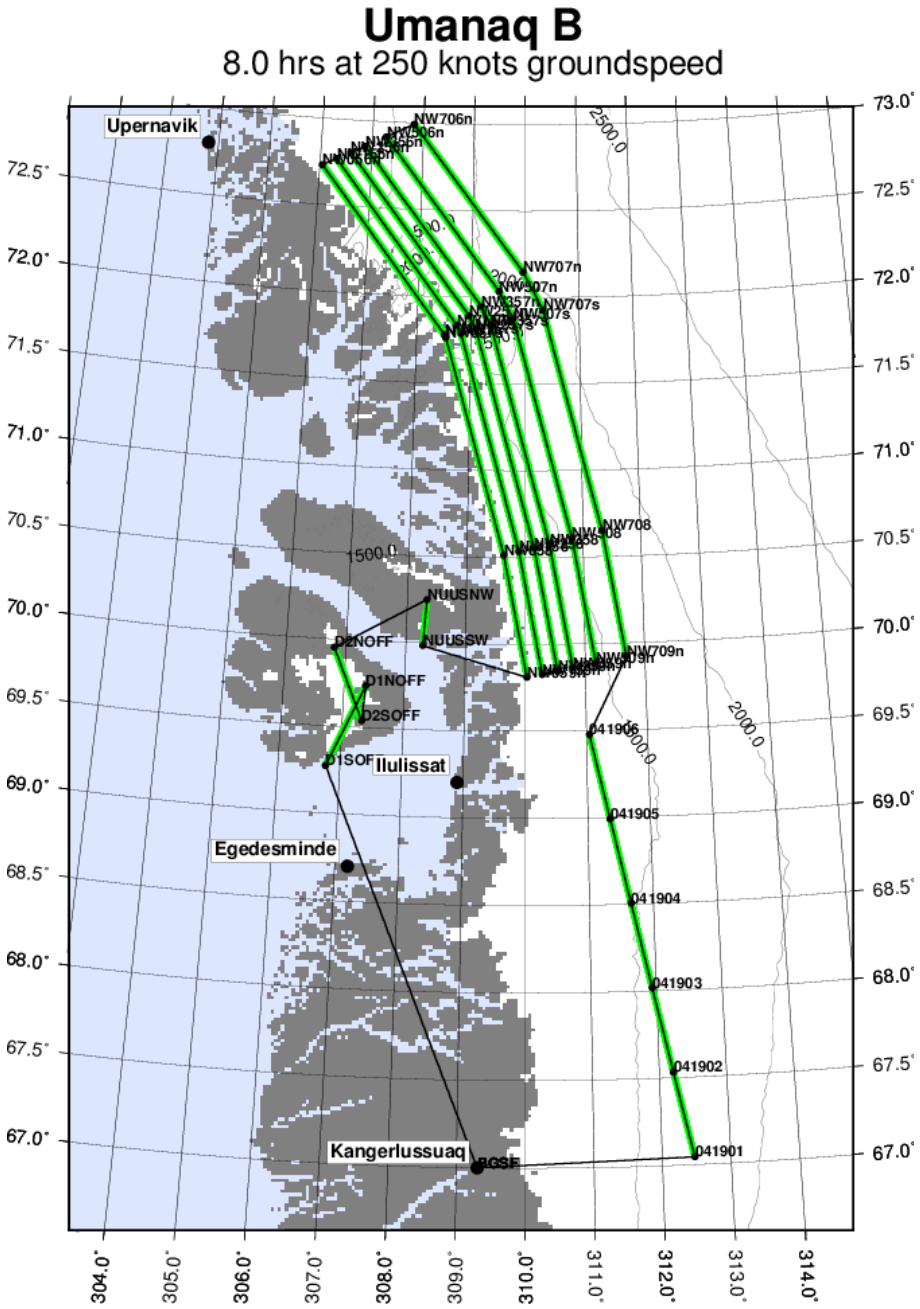
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2012
Remaining Issues: none known



Land Ice – Umanaq B / Kangerlussuaq

This is a new mission, designed (along with Umanaq A) to refly the 2012 Umanaq coast-parallel grid with a pair of interlaced missions. This mission by itself reoccupies a grid spaced at 10 km near the coast, widening to 20 km upstream. The two flights together establish a grid at half this spacing.

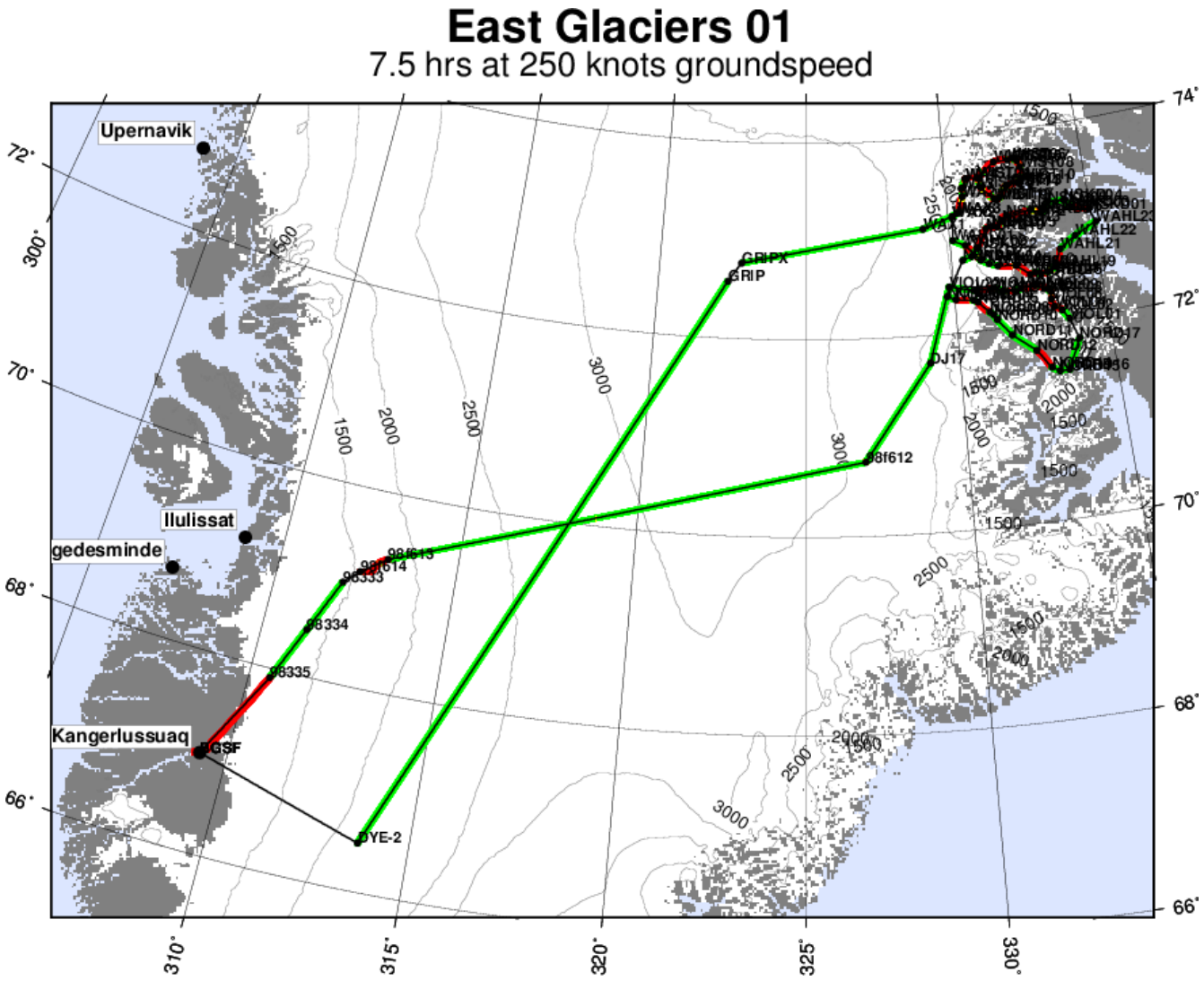
Flight Priority: high(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2012
Remaining Issues: none known



Land Ice – East Glaciers 01 / Kangerlussuaq

This mission maps the centerlines of several glaciers on the central east coast of Greenland. This particular draft captures the centerlines of six glaciers: DeGeer, Jaette, Nordenskiold, Wahlenberg, Violin and Nord Glaciers. The first two were originally flown during the 2009 OIB campaign, and all were flown in 2012. The Violin centerline passes within 1 km of two PROMICE sites. We transit to the area along a line connecting the DYE2 and GRIP drill sites, and return along a historical ATM line dating to 1993.

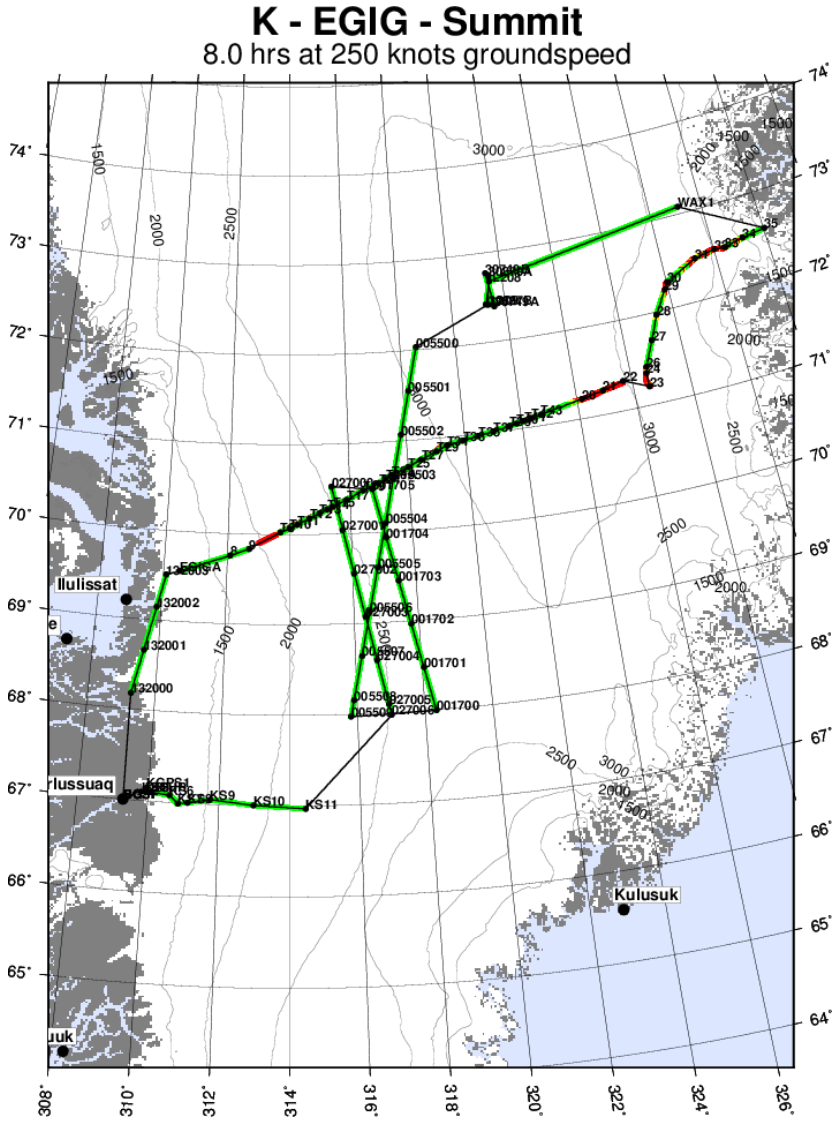
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2014
Remaining Issues: none known



Land Ice – K-EGIG-Summit / Kangerlussuaq

This mission was designed to accomplish a number of high-priority tasks. First, we refly the van den Broeke "K-Transect" in the Russell Glacier catchment, consisting of several sites where comprehensive glaciological measurements are collected annually. We also fly the EGIG traverse line, which is expected to be occupied as part of the CryoVex effort in spring 2014. We overfly the IceSat-1 track 412 Summit calibration site, and we fly two IceSat-2 groundtracks in the same area near Summit, with the expectation that these will become regular calibrations sites as well. Finally we extend the coverage of the Jakobshavn basin upstream along IceSat-1 tracks, to capture continued inland progression of thinning there.

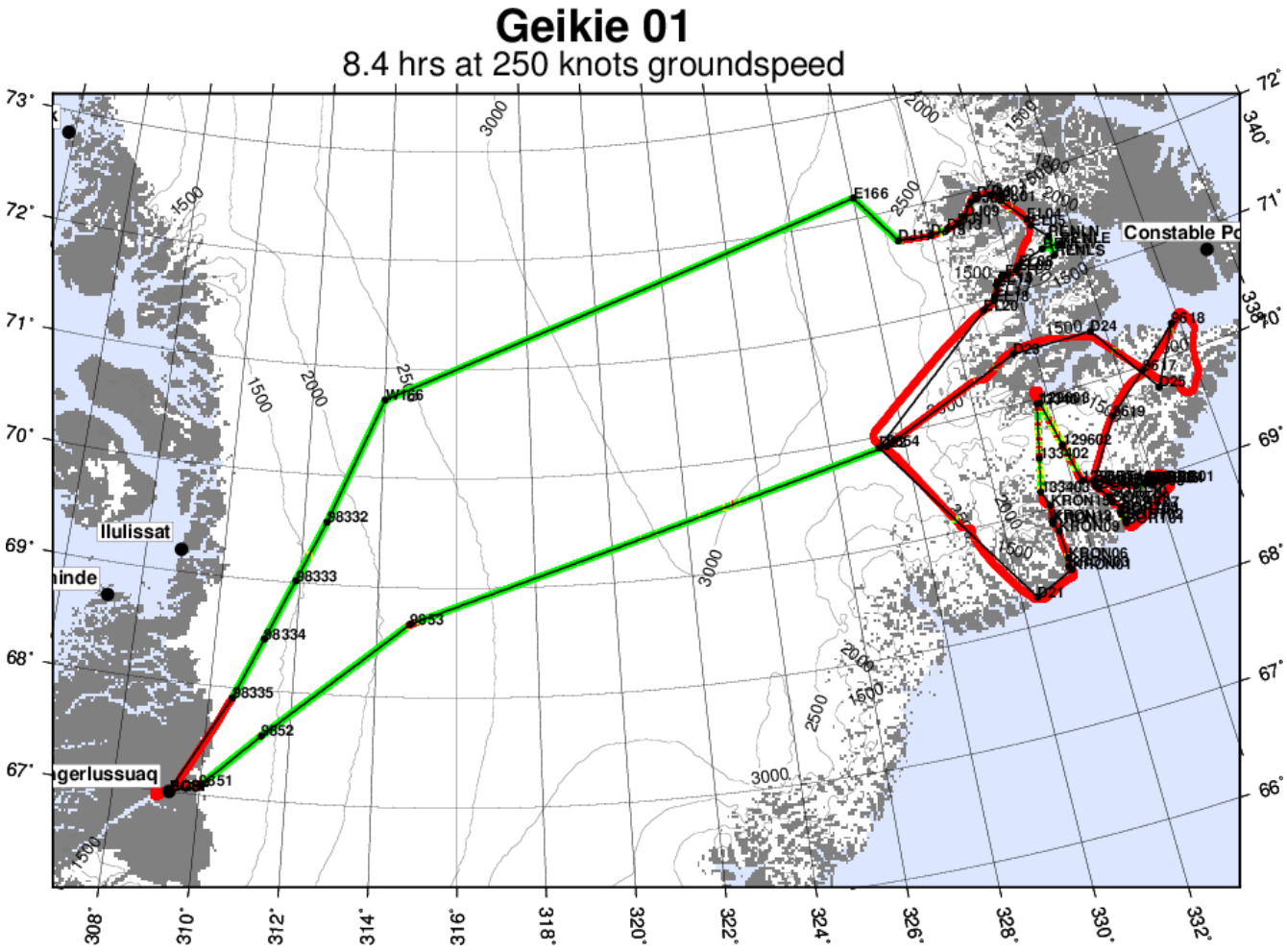
Flight Priority: baseline (annual repeat flight)
ICESat Track: 0055,0017,0270
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Geikie 01 / Kangerlussuaq

This mission is a repeat of 2010, 2011 and 2014 IceBridge missions. It includes reflights of the Daugard-Jensen, Vestfjord and Kong Christian IV glaciers, and the "X" pattern over the Geikie Plateau, all of which have pre-IceBridge altimetry from ATM. It also reflies the Eielson, De Reste Bugt, Sortebrae and Kronborg glaciers, first flown in 2010. Finally, the northern transit line across the ice sheet is a master grid line, which has not been flown prior to 2014.

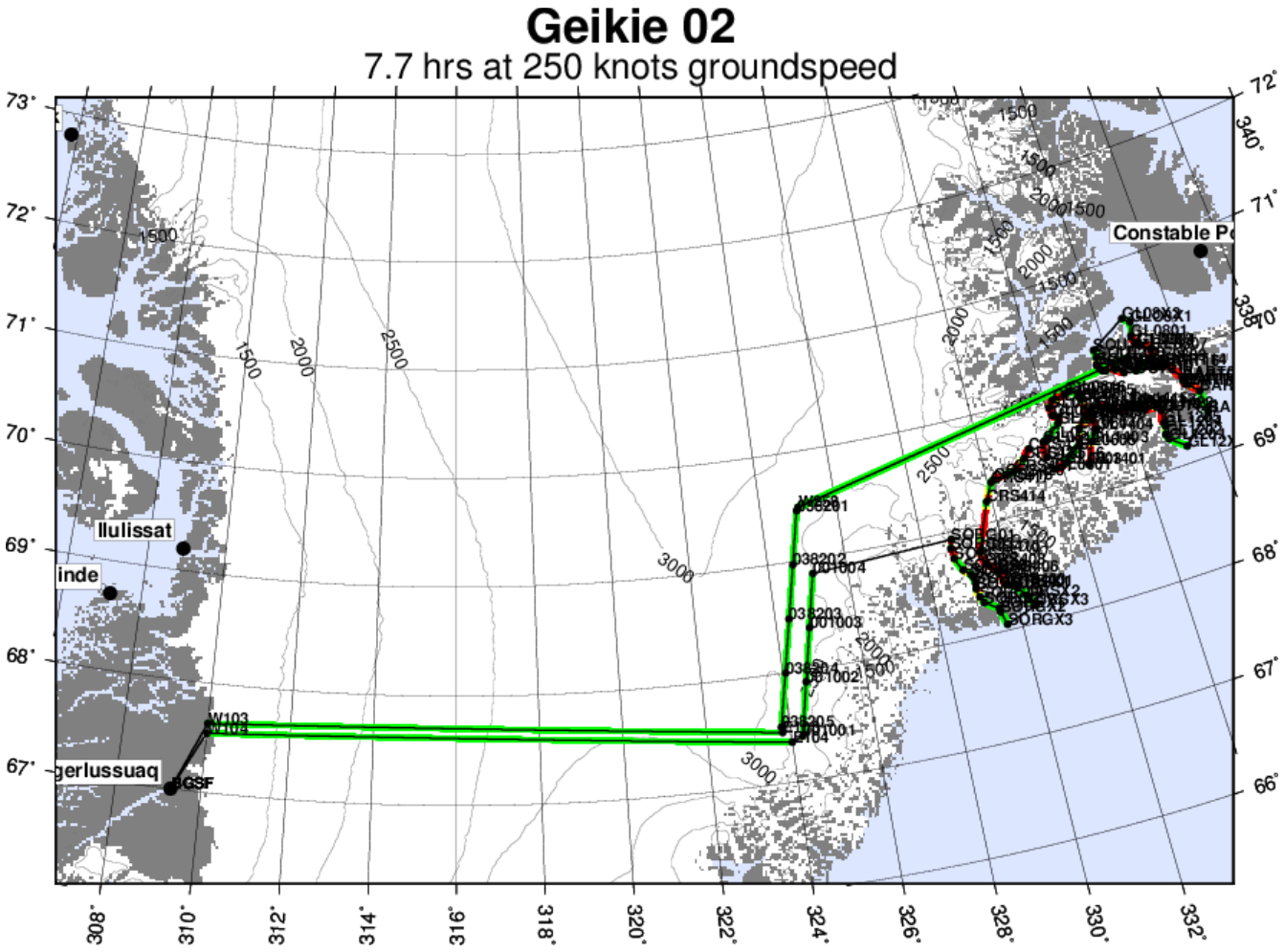
Flight priority: low(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Geikie 02 / Kangerlussuaq

This mission flies the centerlines of eight Geikie peninsula glaciers. These are Sorgenfri, Christian IV, Bartholins, and South glaciers, plus five more glaciers with unknown names. We transit to and from the Geikie area along master grid lines and IceSat-1 ground tracks.

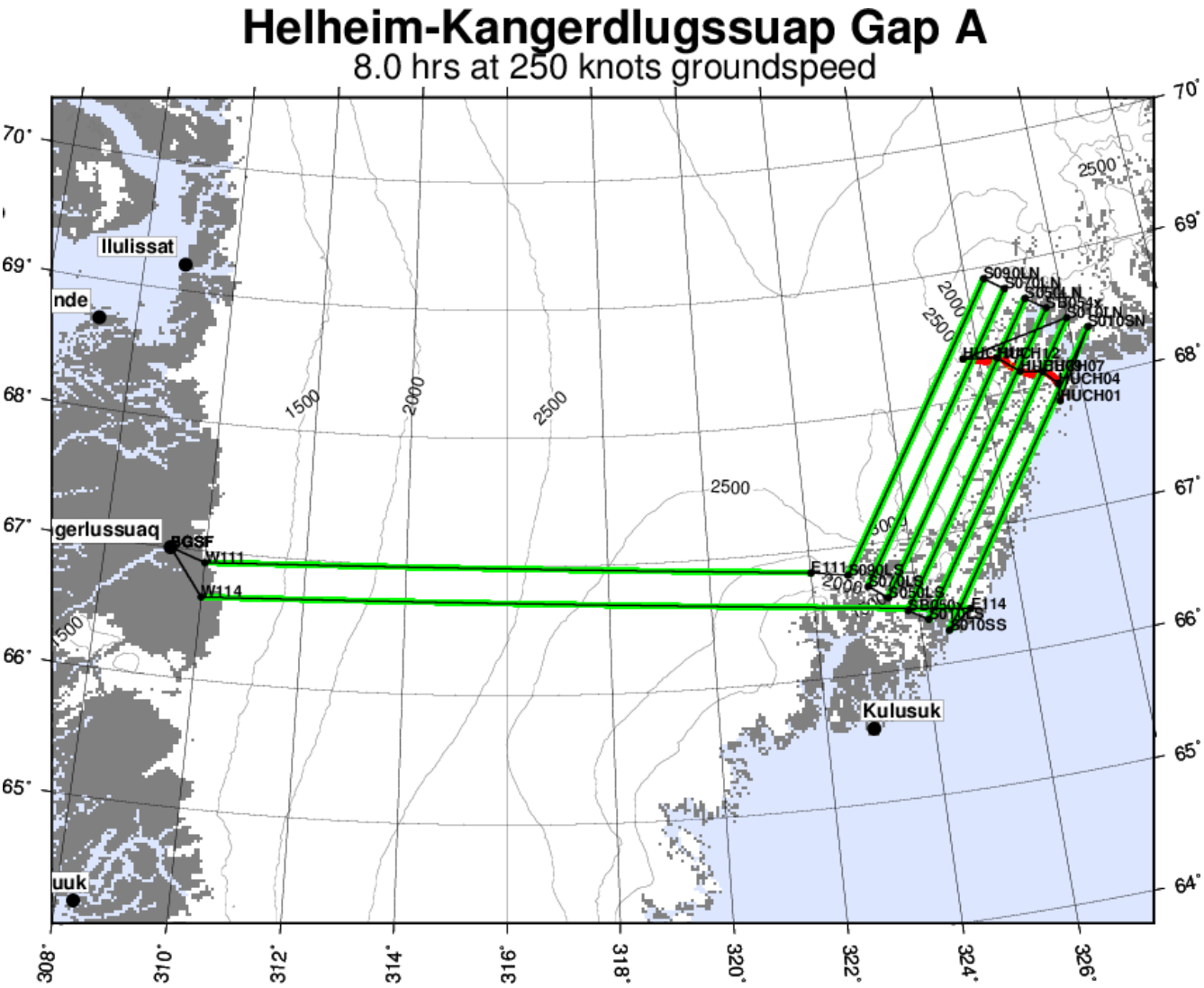
Flight Priority: high(?) (multi-year repeat flight)
ICESat Track: 0010, 0382
Last Flown: 2012
Remaining Design Issues: none known



Land Ice – Helheim-Kangerdlugssuaq Gap A / Kangerlussuaq

This is a new mission, designed (along with Helheim-Kangerdlugssuaq Gap B) to refly a 2012 grid over the area of complex terrain between the Helhim and Kangerdlugssuaq Glaciers. Each of these news missions alone forms a coast-parallel grid spaced at 20 km, and the two flights together interlace to form a 10-km grid. This particular mission also reoccupies the centerline of the Hutchinson Glacier.

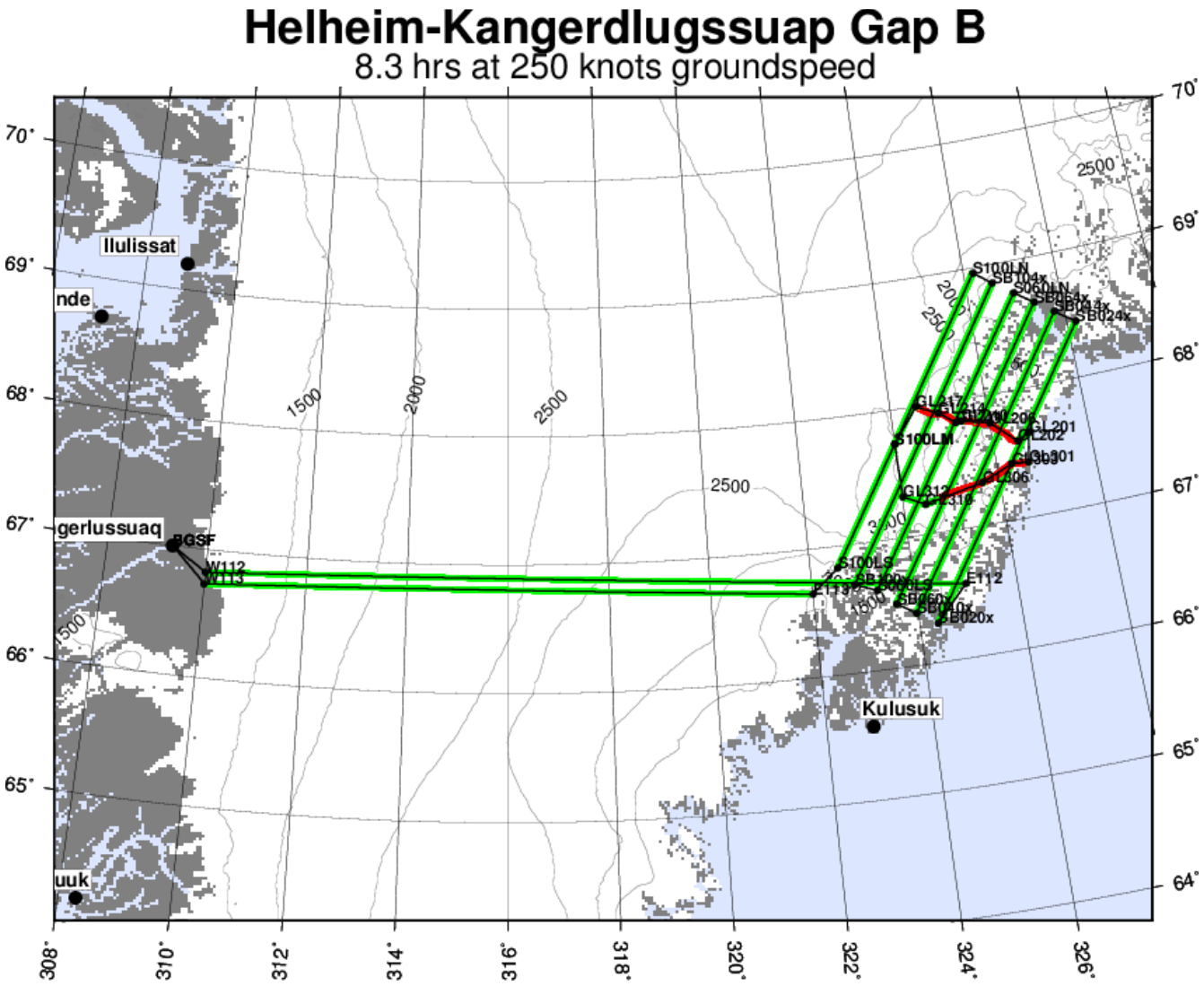
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2012
Remaining Design Issues: none



Land Ice – Helheim-Kangerdlugssuaq Gap B / Kangerlussuaq

This is a new mission, designed (along with Helheim-Kangerdlugssuaq Gap A) to refly a 2012 grid over the area of complex terrain between the Helhim and Kangerdlugssuaq Glaciers. Each of these news missions alone forms a coast-parallel grid spaced at 20 km, and the two flights together interlace to form a 10-km grid. This particular mission also reoccupies the centerlines of two glaciers in the area (names unknown).

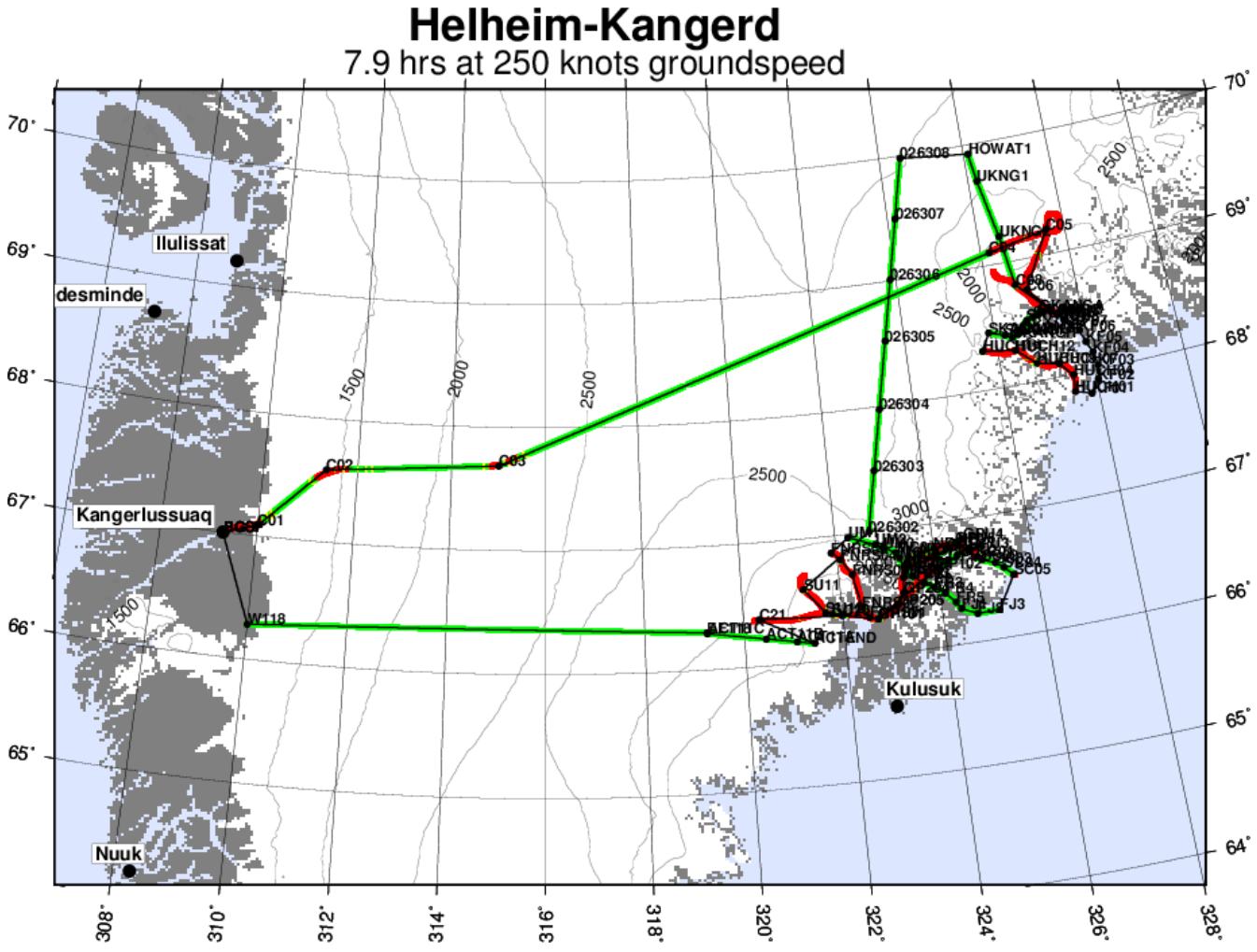
Flight Priority: high(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2012
Remaining Design Issues: none



Land Ice – Helheim-Kangerdlugssuaq / Kangerlussuaq

This is a repeat mission, and is very similar to missions flown in 2010, 2011, 2012 and 2013. It captures centerline surveys of the two main branches of Helheim, of Kangerdlugssuaq, Fenris and of several branches of Midgard glaciers. We also refly the centerline of the Hutchinson Glacier, and establish a new centerline of a glacier which empties into the fjord of Kangerdlugssuaq Glacier just beyond its terminus.

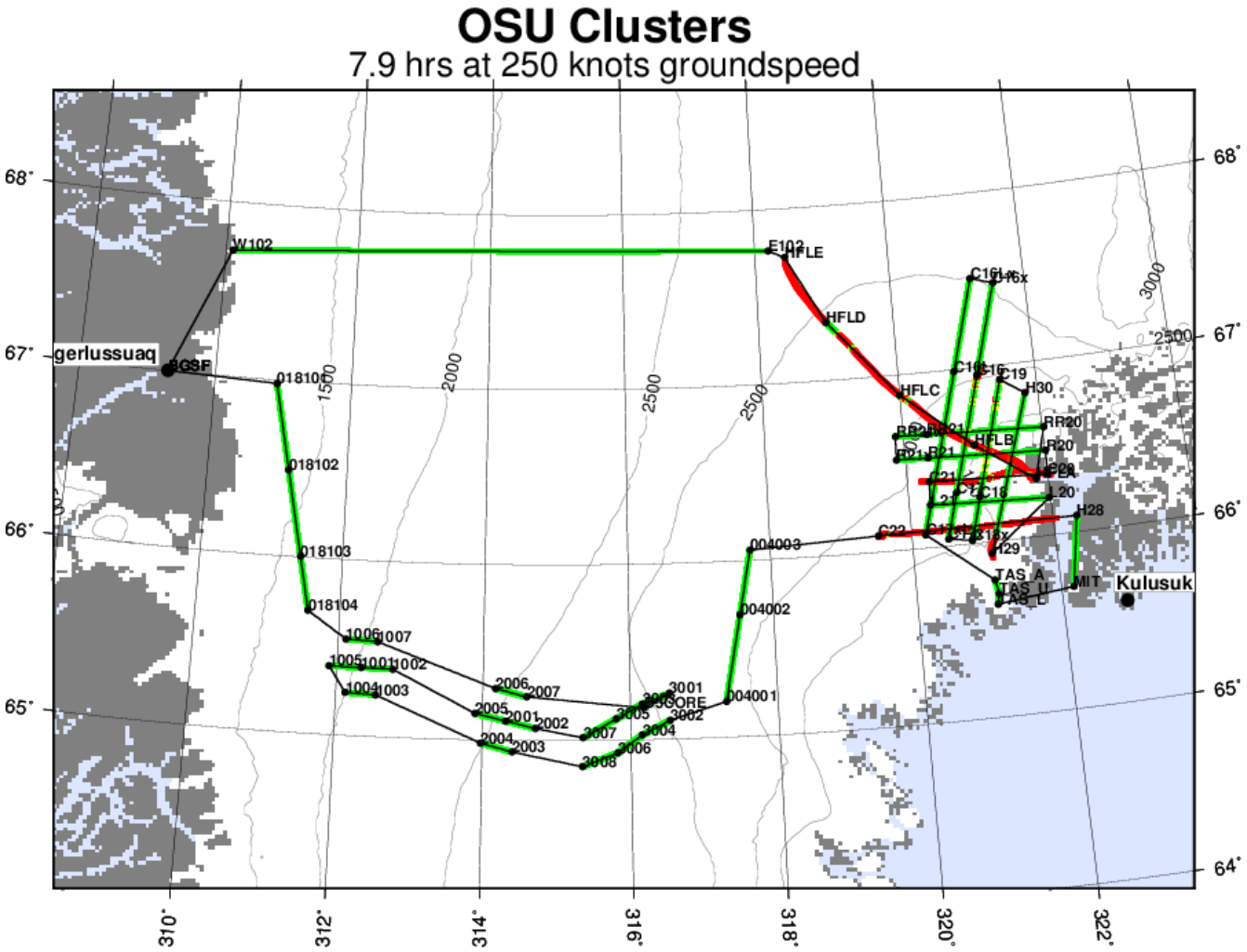
Flight Priority: baseline (annual repeat flight)
ICESat Track: 0263
Last Flown: 2014
Remaining Design Issues: none



Land Ice – OSU Clusters / Kangerlussuaq

This mission was designed with several goals in mind. First, we refly the OSU Cluster sites straddling the ice divide southeast of Kangerlussuaq. We also fly a centerline of Helheim Glacier from the terminus all the way to the ice divide, and we refly a ~15-km grid pattern over the lower Helheim catchment last flown by the ATM/KU teams in 2008. Finally we overfly four PROMICE sites straddling the mouth of Sermilik Fjord, and we overfly the DYE-3 core.

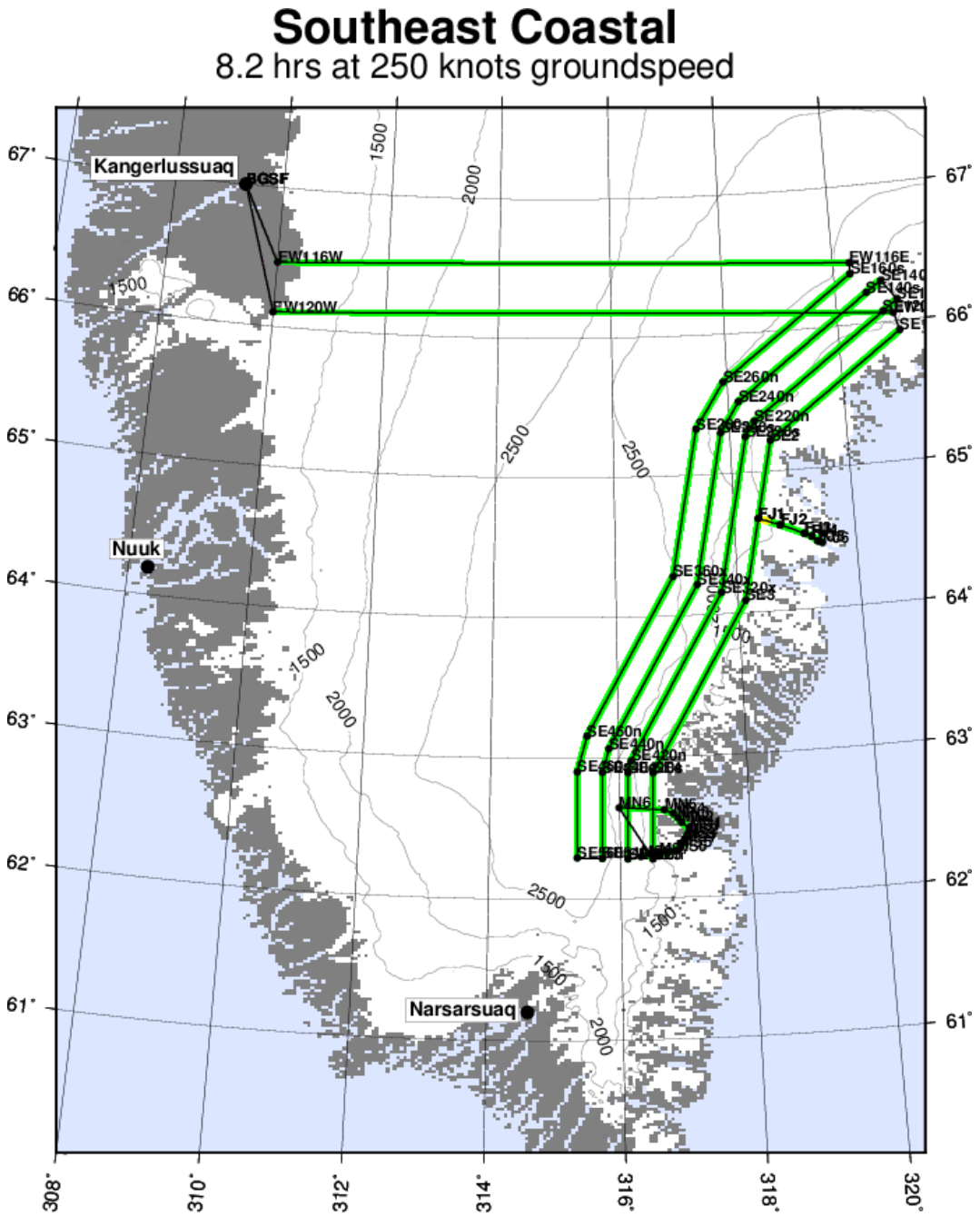
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: 0040,0181
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Southeast Coastal / Kangerlussuaq

This mission reflies a 20-km coast-parallel grid along the southeast Greenland coast, enabling direct measurement of dh/dt in the catchment areas of the many major glaciers in the area across a range of surface elevations. It also reflies the centerlines of the Fritdjof Glacier, as well as two branches of the Mogens Fjord Glacier.

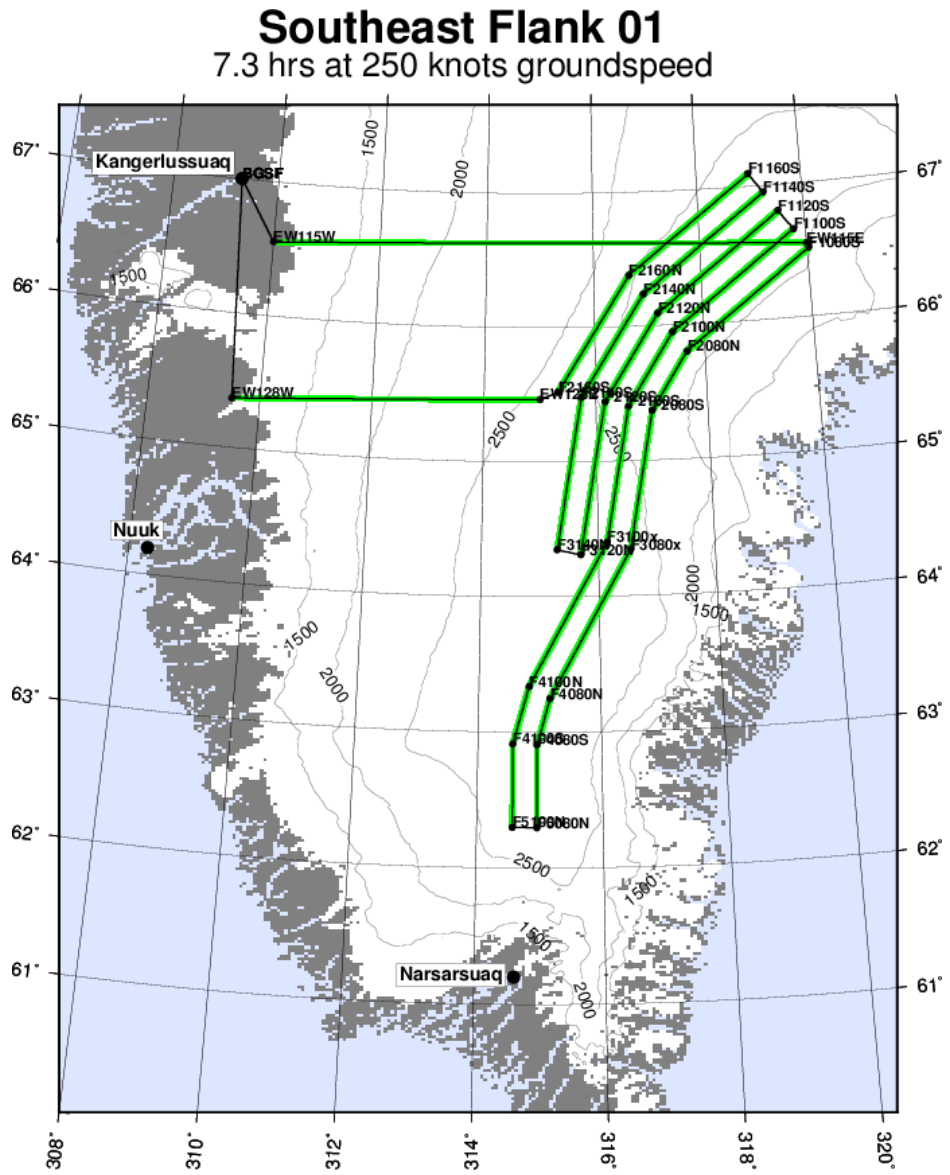
Flight Priority: high(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2010
Remaining Design Issues: none



Land Ice – Southeast Flank 01 / Kangerlussuaq

This mission reflies a 20-km coast-parallel grid along the upper southeastern flank of the ice sheet, enabling direct measurement of dh/dt in the catchment areas of the many major glaciers in the area across a range of surface elevations. It continues the dh/dt record of the Southeast Coastal mission up to the ice divide in this area.

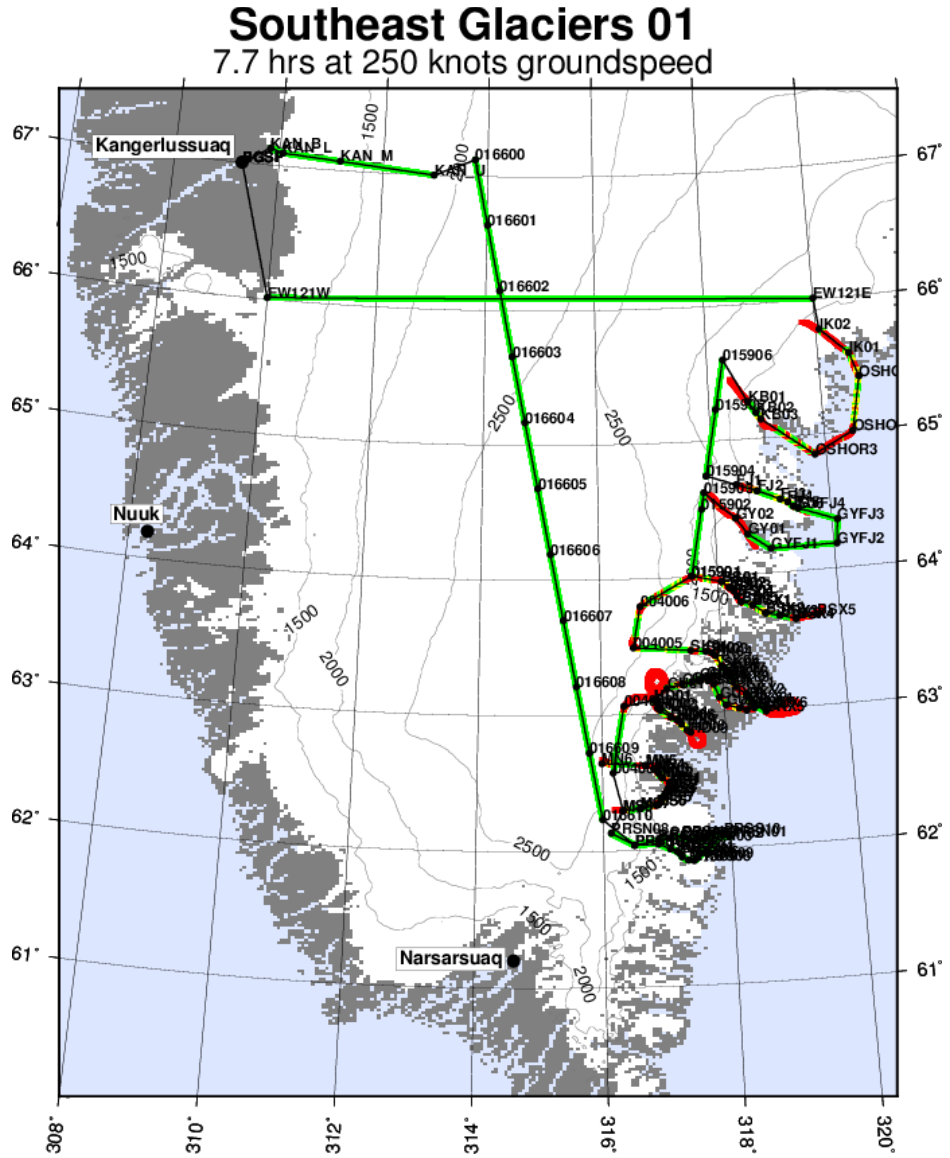
Flight Priority: high(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2011
Remaining Design Issues: none



Land Ice – Southeast Glaciers 01 / Kangerlussuaq

This mission is a repeat of the 2012 Southeast Glaciers mission. Its primary purpose is to continue dh/dt monitoring of 10 glaciers in the southeast which have been flown since 2008, and two additional glaciers in the south near the Pursortoq peninsula first flown in 2012. We also occupy an ICESat line between the southernmost glacier and Kangerlussuaq, and an east-west master grid line between the northernmost glacier and Kangerlussuaq. We overfly four PROMICE sites near Kangerlussuaq. Finally, we fly the north and south branches of the Mogensfjord Glacier in two separate circuits – the first is at normal speed and altitude, and the second is as low and slow as practical, in the hopes of improving McoRDS radar performance there.

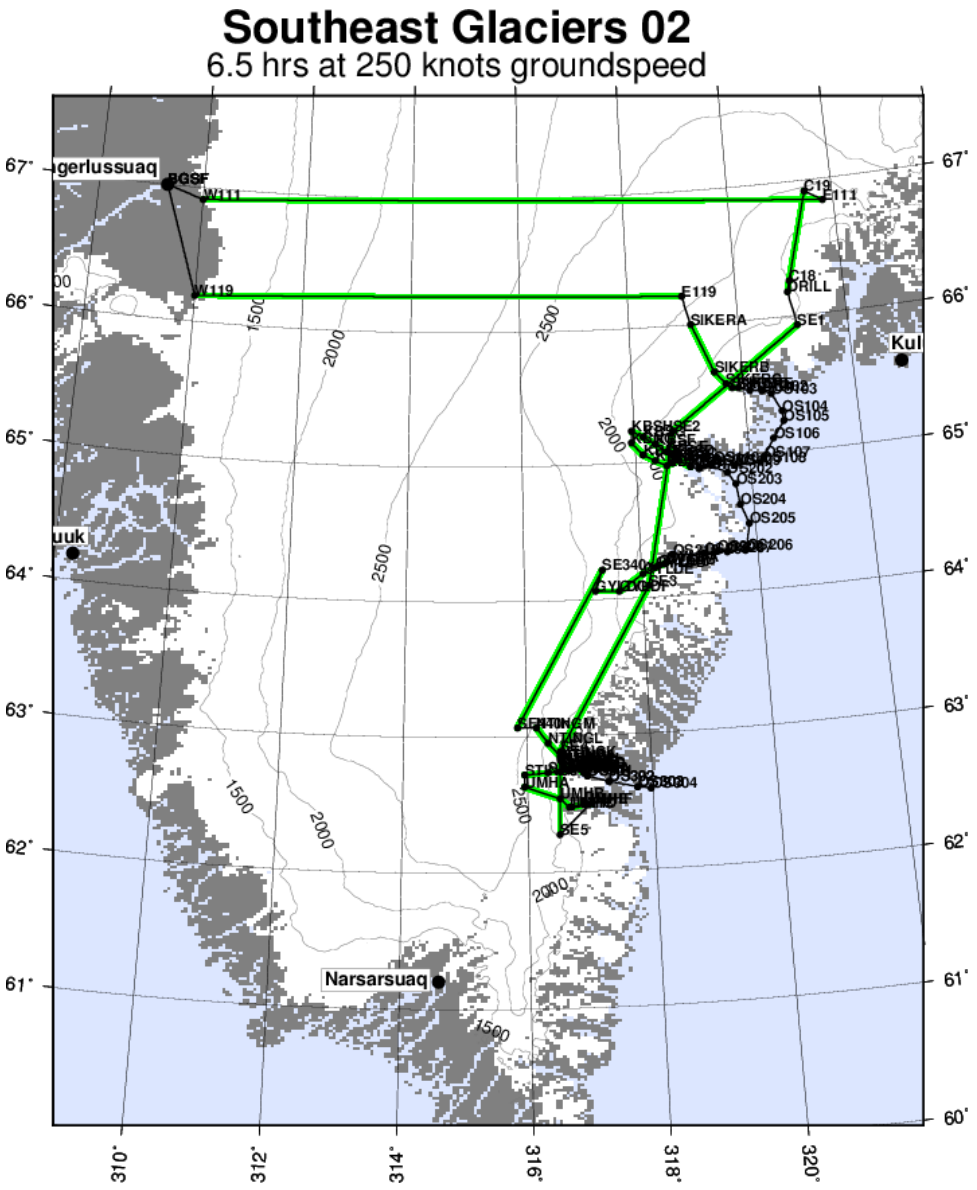
Flight Priority: low(?) (multi-year repeat flight)
ICESat Track: 0166,0040,0159
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Southeast Glaciers 02 / Kangerlussuaq

This mission is designed to fly the centerlines of the largest glaciers in the southeast not included in other OIB missions flown prior to this one. These include a southern branch of Ikertivaq, a wishbone-shaped glacier emptying into Koge Bay, Gyldenlove, the Tingmiarmiut wishbone, and an unnamed glacier emptying into Mogens-Heinesen Fjord. We transit to and from the area on new east-west master grid lines, and we transit between the glaciers on lines previously flown in the Southeast Coastal suite of missions.

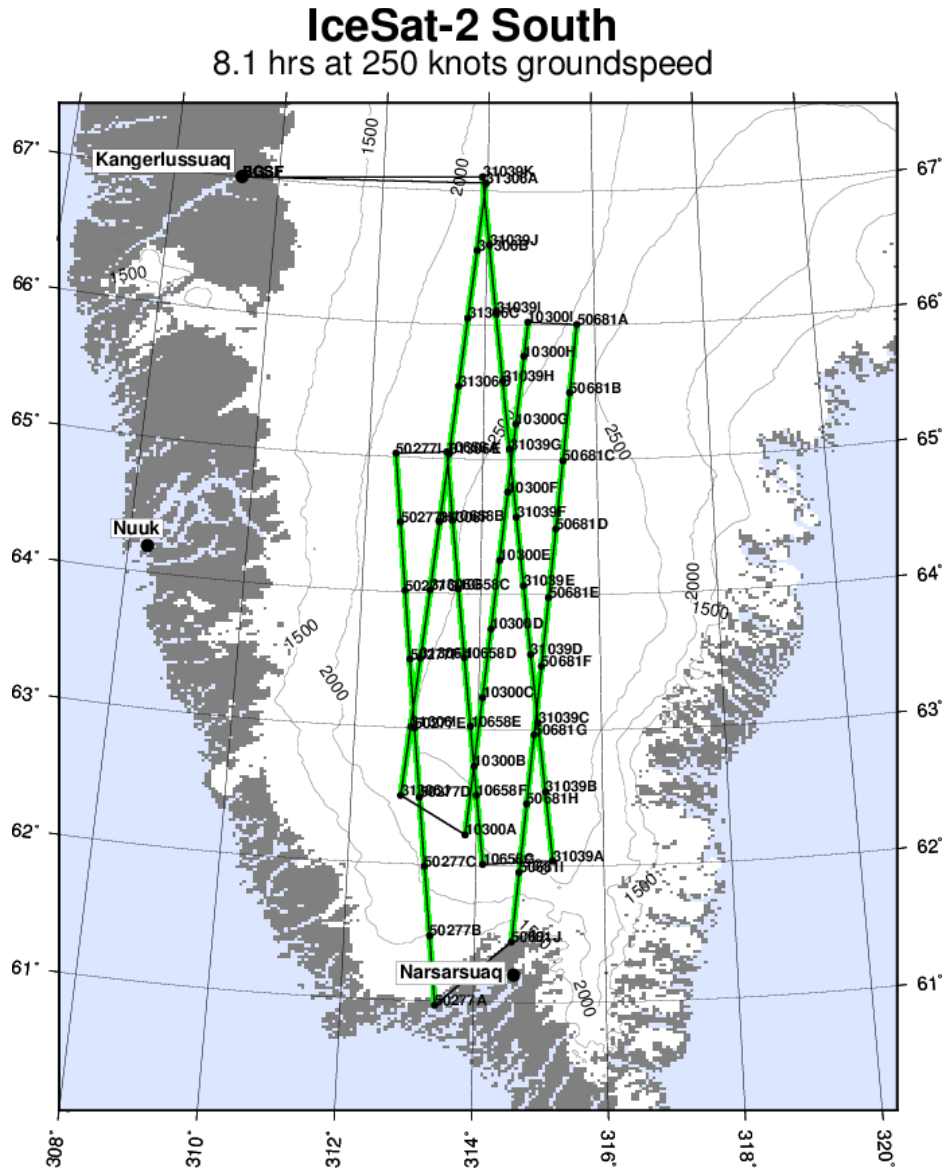
Flight Priority: medium(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: 2013
Remaining Design Issues: none



Land Ice – IceSat-2 South / Kangerlussuaq

This is a new mission, designed along IceSat-2 ground tracks to fill the gap between the southeastern and southwestern suites of missions. We sample a total of six IceSat-2 orbits, mixing left, nadir, and right beam pair overflights.

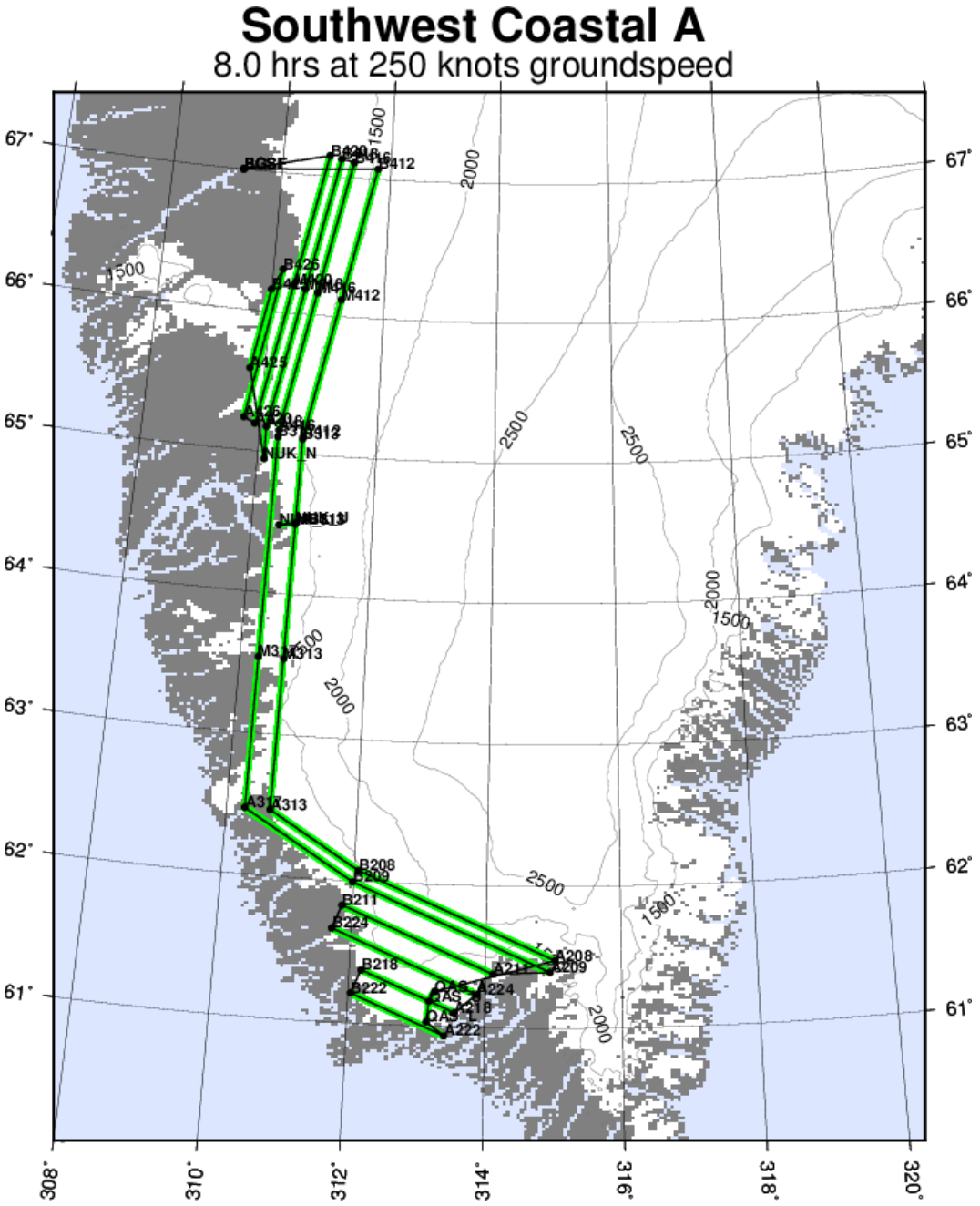
Flight Priority: medium(?)
ICESat-2 Track: 1306,0300,0681,0277,0658,1039
Last Flown: new flight
Remaining Design Issues: none



Land Ice – Southwest Coastal A / Kangerlussuaq

This mission is one of two (with Southwest Coastal B) designed to mirror the southeastern coast-parallel coverage in the southwest, along 2011 LVIS flight lines. This particular flight captures the lowest-altitude portion of this part of the ice sheet. We also overly a total of six PROMICE sites.

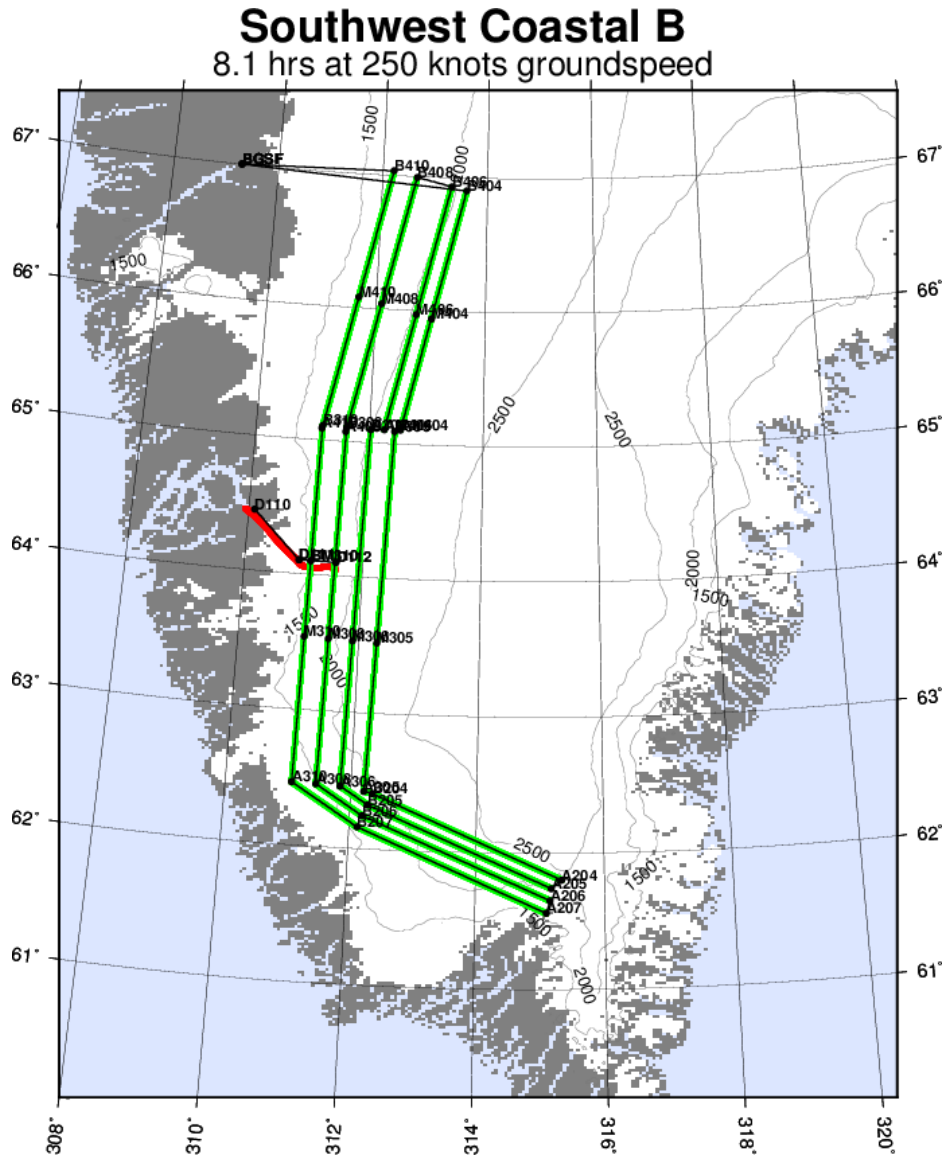
Flight Priority: baseline (annual repeat flight)
ICESat Track: none
Last Flown: 2014
Remaining Design Issues: none



Land Ice – Southwest Coastal B / Kangerlussuaq

This is a new mission, one of two (with Southwest Coastal A) designed to mirror the southeastern coast-parallel coverage in the southwest, along 2011 LVIS flight lines. This particular flight captures the higher-altitude portion of this part of the ice sheet. We also fly an out-and-back pattern on the Kangiata Nunaata Sermia glacier, first at normal speed/altitude and second as low and slow as possible, in order to explore differences in MCoRDS radar performance on a difficult target.

Flight Priority: high(?) (multi-year repeat flight)
ICESat Track: none
Last Flown: portions in 2011
Remaining Design Issues: none



Land Ice – Southwest Glaciers 01 / Kangerlussuaq

This mission incorporates previously-flown lines over Sukkertoppen Ice Cap and over four glaciers near Nuuk, including Kangiata Nunaata Sermia, Tasersuaq, Narsap Sermia, and Akugdlersupasermia. We also refly a series of ICESat lines covering the southernmost lobe of the Greenland Ice Sheet. We return to Kangerlussuaq along a lengthy ICESat track over southern Greenland.

Flight Priority: low(?) (multi-year repeat mission)
ICESat Track: 0040,0412,0047,0159,0300
Last Flown: 2014
Remaining Design Issues: none